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ABSTRACT

These three occasional publications contain the following articles: (1) Varieties of Interdisciplinary Approaches in the Social Sciences (Raymond C. Miller); (2) Five Arguments against Interdisciplinary Studies (Thomas L. Benson); (3) What Are Transdisciplinary Principles? (Robert W. Winquist); (4) Can Progress toward Interdisciplinary Education Be Built on a Disciplinary Base? (Jerry C. Petr); (5) The Case for Interdisciplinary Studies: Response to Professor Benson's Five Arguments (William H. Newell); (6) The Case For/Against Interdisciplinary Studies: A Comment on the Debate (Jerry L. Petr); (7) What Do You Way to a Devil's Advocate? (Raymond C. Miller); (8) The Devil's Due: Some Reflections on the Responses (Thomas L. Benson); (9) The Dialectic and Rhetoric of Disciplinary and Interdisciplinary (Julie Thompson Klein); (10) Dialogue with Autobiography: Integrating through the Study of Personality (Mark E. Blum); (11) A Qualitative Model of the Integrative Learning Process (Francis Betts, III); (12) Interdisciplinary Studies as a Counterculture: Problems of Birth, Growth, and Survival (Martin Trow); (13) Against and For Holism: A Review and Rejoinder to D.C. Phillips (Stanley Bailis); (14) Interdisciplinary Theory and Ambiguous Form Perception (Elaine L. Kleiner); (15) Where Do Ideas in Science Come From? Teaching Light and Vision as a Case Study (Lance Schachterle); (16) Introducing the Liberal Arts through Interdisciplinary Inquiry: Proposal for an Integrative General Education Experience (Mark E. Blum); (17) Interdisciplinary and Dialectics: Integrative Concepts and Methods in Hegel's "Phenomenology of Spirit" (Guy V. Beckwith); (18) Transdisciplinary Principles and Processes Inherent in the Evolution of Complex Systems (Robert J. Williams); (19) "On Becoming a Social Scientist" by Shulamit Reinharz: A Critical Review (Bob Arango). (RB)

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ISSUES IN INTEGRATIVE STUDIES

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1982

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The Association for Integrative Studies was founded in 1979 to promote the interchange of ideas among scholars and administrators in all of the arts and sciences on both intellectual and organizational issues related to furthering integrative studies. It is incorporated as a non-profit educational association in the state of Ohio and recognized as such by the IRS. The purposes of the Association are:

1. To articulate the nature of integrative studies and to document their importance for higher education and for society.
2. To establish standards of excellence for the conduct of integrative studies in both research and teaching.
3. To maintain a communication network for the exchange of scholarly and pedagogical information on integrative studies among faculty and administrators in higher education.
4. To enhance research and teaching in integrative studies by promoting the development of interdisciplinary theory, methodology and curriculum design.
5. To serve as an organized voice and as a national source of information on integrative and interdisciplinary approaches to the study of human experience.

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VARIETIES OF INTERDISCIPLINARY APPROACHES IN THE SOCIAL SCIENCES: A 1981 OVERVIEW*

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I. Historical Interplay between Specialization and Integration

Ever since the appearance of the social sciences as separate domains of inquiry in the late nineteenth century, an interplay has occurred between movements for greater specialization on the one hand and efforts at interdisciplinary integration on the other hand.[1]

Auguste Comte, one of the founders of modern social science, envisaged a unified social science. In the middle of last century he expressed a concern that specialization in human thought, while permitting a "felicitous development of the spirit of detail otherwise impossible . . . spontaneously tends . . . to snuff out the spirit of togetherness, or at least to undermine it profoundly."[2]

Toward the end of the nineteenth century, the American Social Science Association was struggling heroically to keep the social sciences together and focused on solving human problems. But the centrifugal forces of specialization and professionalization associated with the industrialization of America spurred the establishment of one separate social science discipline after another. With the founding of the American Political Science Association in 1903 and the American Sociological Society in 1905 the original Social Science

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*Presented at the Third Annual Conference of the Association for Integrative Studies, April 3, 1981.

Association was reduced to an empty shell that totally collapsed a few years later.[3] Yet, ironically, Professor Albion Small, one of the founders of the American Sociological Society and the first editor of its journal, wrote in 1910:

> Specialized science, whether physical or social, inevitably passes into a stage of uncorrelated scientific piece-work. In this stage of dismemberment, science is as inconclusive through its lack of coherence as it was in an earlier period from its superficiality. That is, it then had breadth without depth, it now has depth without breadth.[4]

The Social Science Research Council was organized in the 1920's with the explicit purpose of providing a forum for integration across disciplines.[5] And in the 1930's, Otto Neurath at the University of Chicago intitiated an impressive effort to prepare an *International Encyclopedia of Unified Science*. Despite these efforts, a painful fact of reality was stated by R. S. Lynd in 1939:

> The failure of the social sciences to think through and to integrate their several responsibilities for the common problem of relating the analysis of parts to the analysis of the whole constitutes one of the major lags crippling their utility as human tools of knowledge.[6]

The problem and the need have not disappeared to this day. In fact, the situation may have worsened in some respects while improving in others. Disciplines and subdisciplines are now more numerous and more firmly entrenched in the academy than ever. Yet the social movements of the sixties spawned several new interdisciplines which are still in existence. Moreover, the prevalent vocationalism of the seventies has shifted attention from the theoretical to the applied fields of study, which are by necessity interdisciplinary in nature.

An interdisciplinary program that offers a curriculum explicitly designed to help students overcome some of the fragmentation of knowledge soon discovers that neither students nor faculty are satisfied with a program that does not go beyond strident critique of excessive specialization or exhortations to "put things together, to make man whole again," no matter how cathartic this may be. To further complicate matters, the label "interdisciplinary" itself became a buzzword for all the curricular reforms introduced in the late sixties and intended to make college education "more relevant." A plethora of "innovative" "interdisciplinary" programs sprouted up all over the country. Many of these were stronger on admirable sentiment than on intellectually defensible content or structure. Interdisciplinary faculty had to articulate more effectively just what it was they were about so that they could answer the students who wanted to know what interdisciplinary studies were as well as to respond to skeptical colleagues in the traditional departments who were displaying an increasingly jaundiced eye towards "all this interdisciplinary stuff."

During the turmoil of the late sixties I wrote a small paper in which I attempted to make some basic distinctions between various kinds of interdisciplinary approaches in the social sciences.[7] A few years later the seminal OECD study appeared, entitled *Interdisciplinarity: Problems of Teaching and Research in Universities*. Not only did this study set the framework for almost all subsequent discussion on the subject, but it also established the term "interdisciplinarity" in our professional jargon.[8]

The early 1970's also witnessed that diffusionary phenomenon of an idea spreading like wildfire through the nation's higher academies, namely Thomas Kuhn's *Structure of*

Scientific Revolutions.[9] All at once, anyone not talking about the "paradigms" of scientific disciplines was hopelessly out of it. That included social scientists, even though Kuhn himself had called their disciplines "pre-paradigmatic." Interestingly, Kuhn's book is part of the first and only published volumes of Professor Neurath's *International Encyclopedia of Unified Science* mentioned above. Kuhn's work in the history of science does help us to clarify the meaning of that fundamental concept, academic discipline.

II. The Concept of Discipline

The term discipline refers to areas historically delineated by departmentalization. Thus in the social sciences the generally recognized disciplines are anthropology, economics, history, geography, political science, psychology and sociology. Within each discipline there are rational, accidental and arbitrary factors responsible for the peculiar combination of subject matter, techniques of investigation, orienting thought models, principles of analysis, methods of explanation and aesthetic standards. Each social science discipline looks at a part of the world of human behavior in its own peculiar way.[10] They have divided this same material field into "several conceptually distinct levels, aspects, functions and dimensions."[11]

In fact, disciplines in any field are characterized by their special filtering and interpreting devices. Over time, the members of a particular discipline acquire a shared set of principles by which their inquiries are directed. These principles direct the disciplinarian to observe certain facts out of the virtually infinite variety of possibilities. These facts are organized by the conceptions -- the "make-sense patterns" -- of the discipline, and thus are given meaning. As Joseph Schwab has so persuasively demonstrated,

> The scientific knowledge of any given time rests not on the facts but on selected facts -- and the selection rests on the conceptual principles of the inquiry. Moreover . . . it is of the facts interpreted, and this, too, depends on the conceptual principles of the inquiry.[12]

The structure of the discipline, therefore, tends to determine what aspect of reality is studied, how it is understood, and the relative validity of the descriptive and explanatory statements derived therefrom.[13]

Kuhn's discussion of paradigms makes essentially the same argument about what guides scientific inquiry; only the concept paradigm is used to stand for all the elements defining a discipline mentioned above. In his 1969 postscript, Kuhn labeled the "common possession of the practitioners of a particular discipline" its "disciplinary matrix" and discussed four components: symbolic generalizations, beliefs -- including beliefs in particular models, values and exemplars (the previously successful problem-solving approaches). He now wishes to limit the meaning of paradigm to the last component, but admits that it will be difficult, as it has "assumed a life of its own."[14]

Whatever one calls the basic shared views of a group of scholars-teachers-researchers organized into a discipline, there is no doubt about their existence nor their impact on the transmission and pursuit of knowledge. Speaking of higher education, Joseph Kockelmans recently observed,

> Our world has become splintered and fragmented by the fact that each individual discipline has developed its own general conceptual framework, its own set of theories and methods, all of which in the final

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> analysis rest on implicit philosophical assumptions and ultimately lead to different conceptions of the world.[15]

In other words, each disciplinary community shares its own unique world view.[16]

Robert Redfield described world view as the way a group of people organize their conceptions, their feelings about their experience and things in that experience. It is a "stage set." "World views are visions outward from the self . . .and conceptions of everything." They contain a sense of order, of what is real and how knowledge is obtained. They are the "underlying premises" of thought.[17]

The advantages of using "world view" as a conception in understanding disciplines are several. World view is a universal concept. Every culture, every subculture and every group has one. Students can more easily acquire an understanding of something if they themselves have experienced it. No arguments arise over whether a group has acquired one yet or not. The degree of unanimity or complexity of a world view are questions to explore, not determinants of presence or absence. Furthermore, world view points to the conceptual construction which is used by a group to interpret reality. In my view, it is that conceptual framework, the associated images and metaphors, plus the understandings of relationships among them which pre-eminently influence how the members of one discipline think in contrast to the members of another discipline. It is not subject matter or the naming of a single central concept that identifies the essence of a discipline, but the predominant thought model or models. "Any kind of discourse in the social sciences presupposes a model which specifies the basic relationships of human beings to the environment. This is true even when the details of the model are not spelled out."[18]

Economics, which probably has the most conceptual order among the social sciences, has its market model. It is a fully articulated logical model with assumptions on human nature; a specified set of roles and relationships; a single, commensurable, all-pervasive indicator; a calculus; a mode of representation and a predictable set of consequences if certain conditions hold. Does it not meet Heckhausen's "most crucial criterion level of a discipline -- the level of theoretical integration"?

> Each empirical discipline tries to reconstruct the 'reality' of its subject matter in theoretical terms in order to get hold of that overwhelmingly complex reality, in order to understand, explain and predict phenomena and events involving the subject matter.[19]

Certainly the degree and type of theoretical integration varies from one discipline to another, due largely to accidents of historical configurations. The range in political science from philosophers to behaviorists produces compartmentalized subfields; yet the elan of identify with the overall discipline manages to hold the parts together. In other disciplines, such as psychology, different schools of thought compete to explain the same subject matter: behaviorists vs. psychoanalysts vs. phenomenologists etcetera. As Professor Newell contends, these competing schools of thought do complicate matters further.[20] Nevertheless, there are underlying premises which members of disciplinary groups do share and which distinguish one group from another. Would anyone deny the existence of important world-view differences between political scientists and psychologists? The problem comes in identifying them, describing them and finding ways to verify them.

Another advantage of using world view as the primary means of distinguishing one discipline from another is its efficiency. No one can learn all the research specialties, techniques and findings of a single discipline, let alone several. Nor can very many individuals be expected to achieve enough conditioning in several disciplines so that they fully internalize their respective paradigms. Needed is a consciously explicit, feasible and valid device for acquiring an effective comprehension of the key distinguishing attributes of the social science disciplines. *World view* meets that need.

Finally, *world view* provides a conceptual handle for making distinctions between different interdisciplinary approaches. To what degree components are coordinated and conceptually ordered provides one axis of differentiation. Shared underlying premises serve as another basis for categorizing.

The following taxonomy of different interdisciplinary approaches elaborates on a scheme which I proposed in my earlier paper. It has also benefited from other definitional and classification proposals which appeared in the 1970's,[21] but it differs substantially from each of them. There is no eternal verity to the definitions or labels proposed. Nevertheless, the distinctions themselves are useful as an aid to communication within both educational and research contexts.

The three basic approaches to interdisciplinary study in the social sciences can be conveniently identified as *multi-disciplinary*, *cross-disciplinary* and *trans-disciplinary*. *Interdisciplinary* then remains the generic all-encompassing concept and includes all activities which juxtapose, apply, combine, synthesize, integrate or transcend parts of two or more disciplines. Multi-disciplinary activity involves juxtaposing, but experiencing little contact between the participating disciplines. Cross-disciplinary approaches involve real interaction across disciplines, though the extent and nature vary considerably. Trans-disciplinary approaches feature overarching thought models which propose to replace existing disciplinary world views.

III. The Multi-Disciplinary Approach

The multi-disciplinary approach involves the simple act (not easily accomplished in many graduate schools) of juxtaposing several disciplines. A student might take courses from several departments, or individual courses might be team-taught by professors from different disciplines. This approach involves no systematic attempt at integration or combination, but merely an exposure to more than one discipline. Many research teams and conference panels follow this pattern. Each disciplinarian does "his own thing" in his own universe of discourse. Consequently, communication is poor, and whatever breadth is achieved remains superficial. Introductory general-education courses in social science often take this multi-disciplinary form. Though interdisciplinary work of this "multi" kind may be better than narrow specialization, a questionable eclectism tends to emerge. The most outspoken critics of interdisciplinary work usually have this approach in mind.

Nevertheless, whenever the public calls for solutions to a serious social problem, multi-disciplinary research teams tend to be established.

> Undoubtedly, when it is a question of solving a problem bearing on social and economic development, it is essential to look beyond the horizons of one specialized discipline; it quickly becomes evident that many links exist between elements which a specialized monodisciplinary scientific analysis would be liable to separate, and the natural impulse is to go beyond the frontiers

> of particular disciplines in order to get a more general and complete picture.[22]

The "real world" is not divided up in the same fashion as academic departments, and policy proposals based on the narrow view of one discipline are at the least naive and in the worst case may lead to disastrous mistakes. Economists have learned this lesson the hard way, for many of their recommendations to the less developed countries have proven irrelevant or erroneous due to their failure to consider the social and political context or the applicability of their culture-bound models.

Many multi-disciplinary research projects produce reports with a chapter from each of the participating disciplinary specialists that show little evidence of communication between them. Professor Millikan of MIT, in reporting the results of a multi-disciplinary research project concerning agricultural problems in less developed countries complained,

> After we had conducted quite a number of these interviews we found we could pretty much predict the answer we would get from any particular specialist if we had enough information in advance about the nature of his specialty. Analysis of agricultural failures tended . . . to follow the discipline of the diagnostician. Each specialist would find that the factor familiar to him was crucial in the given situation, though he might also acknowledge the role of factors in fields other than his own. His prescription would read: 'Do something about my factor first -- and the others will follow.'[23]

Professor Boulding encapsulated some of the problems in verse:

Economists, it's plain to see
All think that prices are the key.
For no economy will grow
With inputs high and outputs low.

Markets and competition now
Must be the hand that speeds the plow --
Making in one Rostowian leap
Corn dear and fertilizers cheap.

Some think the answer lies in Risk;
Others, that land reform's the whisk
To brush away the blocks that bar
Development's immobile car.

For Anthropologists, Tradition
Remains the major inhibition,
And peasants, oftener than we think
When led to water, do not drink.

With facts too many now to list'em
The answer is a General System.
So what has got to be advised
Is 'get the stuff computerized.'[24]

Some multi-disciplinary research teams actually begin talking with each other and start perceiving that communication difficulties are hindering their effectiveness. When they initiate efforts at translating, coordinating, combining and even building conceptual bridges, they are no longer a problem-focused multi-disciplinary group, but one with cross-disciplinary attributes.

Many so-called interdisciplinary courses are problem focused, and as long as the problem continues as the only common thread, they manifest the conceptual compartmentalization of the multi-disciplinary approach. A problem is a good place to begin, because it generates interest on the part of students and faculty from several disciplines and the bringing together has value in itself. However, the problem does not provide a conceptual framework for its own analysis, but has to be provided by the investigators -- the teachers, curriculum builders, researchers. Good education should concern itself with human problems, but collective analysis requires general principles and conceptual frameworks which make possible not only a better comprehension of the nature of the problem at hand and possible solutions but also a set of analytical tools which can be transferred to the understanding of other comparable situations as they present themselves in the future.

IV. The Cross-Disciplinary Approach

Guy Michaud, in his introduction to *Interdisciplinarity*, while defining what I consider the generic term came fairly close to defining what I call the cross-disciplinary approach.

> A cross-disciplinary group consists of persons trained in different fields of knowledge (disciplines) with different concepts, methods, and data and terms organized into a common effort on a common problem with continuous intercommunication among the participants from the different disciplines. ...interaction may range from simple communication of ideas to the mutual integration of organizing concepts, methodology, procedures, epistemology, terminology, data, and organization of research and education in a fairly large field.[25]

I have divided the current state of cross-disciplinary efforts into seven categories: topical focus, professional preparation, life experience perspective, shared components, cross-cutting organizing principles, hybrids and grand synthesis.

Cross disciplinary topics frequently emerge from perceived social problem areas. Crime -- law and order -- is a social concern. Every one of the social science disciplines has something to say about crime. Cross-disciplinary research has been conducted on the subject. Cross-disciplinary courses and programs in Criminal Justice have been established at many institutions of higher learning. Another topical example is Area Studies. World War II gave a boost to Area Studies, and though their fortunes have varied over the years, most universities still offer one or more cross-disciplinary programs in Area Studies (Latin American Studies, East Asian Studies, American Studies, etc.). In response to labor-management conflicts, research institutes and academic programs in Industrial Relations were instigated around the country. More recently, problems in central cities have led to Urban Studies. Concern over an aging population has fostered the new cross-disciplinary field of Gerontology. Worries about the degradation of the environment were instrumental in the appearance of Environmental Studies. Some universities have an entire school devoted to Environmental Studies, such as Griffiths in Queensland, Australia. A few colleges are totally organized around this field, such as Green Bay, Wisconsin. The list of cross-disciplinary topics could go on and on: Religious Studies, Futurism, Human Sexuality, and so on.

The degree of conceptual order in these topical studies varies greatly. In fact, some of the older ones seem to be going through periodic identity crises. In my view these crises are highly related to low degrees of conceptual coherence. Environmental Studies usually has a high degree of conceptual integration, because it has the thought model of ecology,[26] which in turn has kinship with general systems -- a trans-disciplinary approach which will be discussed briefly below.

Academic programs organized around these cross-disciplinary topics frequently utilize courses taught by the various disciplines on their topics (Urban Sociology, Urban Geography, Urban Economics, etc.) and are thus boundary-crossing in that respect. They are not necessarily limited to the social sciences in the disciplines on which they draw -- Environmental Studies being a germane example in that respect. The programs based on these topics are generally considered liberal arts in nature, even though the familiarities acquired by students majoring or minoring in particular fields may be prerequisite to obtaining initial employment in them.

The next cross-disciplinary category, that of professional preparation, differs from the topical by being programmatically self-contained and self-defined as professional rather than a liberal arts education. It has an unequivocally clear vocational focus. Examples include Business (the most thriving field of study today), Nursing, Home Economics, Social Work, Recreation, Health Education, Public Administration, etc. These fields usually have national associations which set standards and accredit the institutions which meet them. The ritual of accreditation binds the practitioners together in common experience and curricula. Many have state certification procedures as well.

Though cross-disciplinary approaches which share a life experience perspective are not unknown in the past, the developments of the late sixties and seventies have made this category a much more prominent one than ever before. Academic programs in Ethnic Studies and Women Studies are outgrowths of the civil rights and women's rights movements of the recent decades. San Francisco State University, for example, has a B.A. program in Women Studies plus an entire School of Ethnic Studies including programs in Asian-American Studies, Black Studies, La Raza Studies and Native American Studies, all established in the 1970's.

The fundamental premise of these life experience perspective programs holds that people who have experienced a similar state of oppression share a similar perspective on all facets of life which differs substantially from the perspective of those representing the white, male-dominated segment of society. The advocates of this view contend that science, especially the biological and social sciences, manifests this social reality as profoundly as any other social product.

> Operating under the guise of objectivity scientists perpetuate a subjective myth of women's inferiority which is contrary to the life experience of women . . . When this leads to the kind of thinking which polarizes the objective and subjective, the rational and emotional, male and female, a dichotomy of knowledge is created which Women Studies rejects.[27]

Though the life experience perspective cross-disciplinary programs of Ethnic and Women Studies claim to holistically encompass all disciplines normally taught within the university, they tend to be either more "humanistic" or "social scientific" in orientation. They are seeking their own unique conceptual framework. Women Studies has an excellent journal (*Signs*) in which this objective is explicitly pursued.

The cross-disciplinary category of shared components has a much longer and quieter history. Similar research methods are often shared across the empirical disciplines. Nearly all the disciplines and subdisciplines in the social sciences utilize the techniques of statistical inference. Statisticians are supposed to be able to ply their trade in any disciplinary context. There are degree programs and professional associations in quantitative methods based on this premise. Many have contended that the mathematics of probability, or game theory, or information theory could serve as a converging conceptual vehicle, albeit at a high level of abstraction, across the separate disciplines. The fact that the symbols in the mathematical structures are not immediately connected to any elements in the material field presumably serves as a special advantage. But not everyone has been convinced by this argument:

> How can mathematical or computer models bridge the gaps between the various subject matters and their respective levels of theoretical integration for disciplines like economics, psychology and geography?[28]

One component which the various disciplines do not share is a common language.

> A basic law is that speakers of the same language, once isolated into separate communities, drift into local idiosyncracies and eventual unintelligibility, once the discipline of common conversation is removed.[29]

Yet this very lack has motivated some ambitious individuals to create a language into which all the differentiated disciplinary jargons could be translated -- a metalanguage. A few information retrieval projects have attempted this task, but none has been widely accepted, or even noticed much, for that matter. Creating an effective metalanguage is no easy undertaking, as my colleague Professor Bailis has observed.

> First, single terms must be devised to stand for similar things and events that are differently named or identified in the disciplinary jargons.
>
> Second, terms are needed to express relationships among interactive things and events which are discretely represented in the several jargons.
>
> Third, these terms must be explicated in a way that represents the disciplinary elements (related conceptions, methodologies and subject matter claims) for which they (these terms) stand as coalescent with respect to a common material field.[30]

This third requirement involves the means of "repairing the diremptions" which "pervasive specialism" has wrought.[31]

A popular cross-disciplinary approach involves the use of cross-cutting organizing principles which are usually encapsulated in a focal concept or a fundamental social process. The concept "role," for instance, can be used to organize ideas and findings across disciplinary lines. All of the disciplines use the concept role to signify certain types of human behavior, though this is embedded in the particular discipline's thought model (the consumer role in the market model, the person playing a role in the social structure as conceived by sociology's structural-functional model, an individual performing a role in history, a person serving as a "role model" in the conceptual framework of one school of thought in psychology, and so on). Another cross-cutting concept is exchange. People, whether in interaction with themselves, others, collectivities or the environment, can be conceived as engaging in exchange relationships. Though the nature and content of the exchange may differ, the overall form may not. Professor George Homans and others have gone further than just organizing findings, statements and research efforts around the concept of exchange: They have proposed an exchange theory which encompasses the total material field of all the social sciences and thus assumes the characteristics of a transdisciplinary approach.[32]

Social processes, like acculturation, socialization and modernization provide highly viable bases for cross-disciplinary cross-fertilization, cooperation and conceptual reorganization. In the course of centering attention on a human social process -- one that is widely experienced and that has observable dynamics with many interrelationships -- conventional disciplinary boundaries are often perceived as stultifying and confining. Modernization studies since World War II have amply demonstrated this point.

> An integrated approach allows the researcher and the experimenter to concentrate on problems of development in general, no less than its parts. The option to this open-ended approach is a further emphasis on disciplinary boundaries. This would yield formal elegance at the expense of the whole spectrum: economic development apart from political development, political development apart from social development, etc.[33]

In one sense modernization studies have turned specialization inside out, because it is modernization itself which has produced greater and greater specialization in all insti-

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tutions of the society, including the scientific enterprise. To then turn around and presume that the highly differentiated reality construction of modernity fits the more diffuse and holistic circumstances of less modernized societies flies in the face of the historical process which the more modernized societies themselves have just been through.

Probably the most readily recognized cross-disciplinary approach is the hybrids. These involve the combining of parts of two existing, related disciplines to form interstitial new cross-disciplines which attempt to bridge perceived gaps between disciplines. Well known examples include social psychology, economic anthropology, political sociology, biogeography, culture and personality, economic history, and so on. As Professor Bailis would note, an effort has been made to combine or converge certain levels, aspects, functions and dimensions.

> Thus, where personality deals with an individual's organization for response to a perceived environment, culture, social structure, economy and polity all pertain to the collective or aggregate level of human activity. Moreover, where culture generally designates the symbolic aspect of collective behavior, the rules of right behavior that are ostensibly followed by an entire population, social structure most often refers to the material aspect, to the way that behavior is affected by membership in specific categories and groupings of people within a population. Polity and economy, on the other hand, view the collective level in terms of specific functions: how the power to make decisions for a people is allocated and used; how the material means of

> satisfying wants are produced, distributed and consumed. The material field of social science is also divided along the dimensions of time and space, for historians seek the pasts of various aspects, levels, and functions of human behavior, while their spatial distributions concern geographers.[34]

Some of the cross-disciplines have developed very distinctive world views, which are then borrowed by scholars back in the home disciplines. Social psychology's symbolic interaction is one case in point.

Finally, there is the cross-disciplinary approach which I have labeled grand synthesis. I introduced this category into my taxonomy in order to distinguish certain proponents of unification of knowledge from my sense of the transdisciplinary approach. The grand synthesizers are scholars who argue that interdisciplinarity correctly refers to the systematic integration of disciplinary structures. They seem to envisage a merging-together of all the scientific disciplines that deal with the same material field, i.e., human behavior. Unfortunately, even though these disciplines may superficially share some attributes, the differences between them are formidable. They do not naturally tend to converge even when brought together in close interaction, because their frames of reference, their languages, their respective world views are fundamentally incommensurable. Each term, each proposition is inextricably embedded in the make-sense pattern of the discipline. There is really no feasible way to add up all the disciplinary components and produce a coherent whole.

V. The Transdisciplinary Approach

The third major category of my classification schema is the transdisciplinary approach. Transdisciplinary approaches are articulated conceptual frameworks which claim to transcend the narrow scope of disciplinary world views and metaphorically encompass the several parts of the material field which are handled separately by the individual specialized disciplines. These overarching thought models are holistic in intent. They propose to reorganize the knowledge structure in the social sciences (and in some cases, other fields of inquiry as well). Though some supporters of transdisciplinary approaches suggest that their favorite conceptual framework should actually replace existing disciplinary approaches, others see them as alternatives or as providers of coherence for cross-disciplinary efforts. The various transdisciplinary approaches differ from each other in several characteristics. One dimension in which they differ is the type of isomorphism claimed between their conceptual structures and the "real world" which they presumably represent. Some claim a greater specificity of correspondence and receptivity to quantitative manipulation while criticizing others for their loose formulations and weakness in empirical application. Supporters of general systems, one of the major transdisciplinary approaches, sometimes criticize other transdisciplinary approaches such as Marxism and structuralism in this fashion. Professor Phillips, an analytic-reductionist, criticizes all transdisciplinary approaches for their methodological inadequacies, but as Professor Bailis states,

> Holistic conceptions clearly provide a different way of looking at the world . . . We may be able to use such conceptions to investigate and understand the objects of our experience in fresh and interesting ways. . . Furthermore, these conceptions are the heuristic guidelines of scientific inquiry and explanation. Modern holism's central ideas -- in-

> ternal relations and isomorphism -- call attention to a pair of important possibilities. First, that it may be fruitful to regard as related or alike those things which we have learned to regard as different or discrete under the impress of analysis and reductionism. Second, that it may be fruitful to attempt to comprehend things so regarded under common sets of assumptions that cross-cut and even integrate our existing systems of knowledge -- our disciplines, if you will, that have become profoundly differentiated under the influence of analytic specialization.[35]

Other transdisciplinary approaches besides general systems, structuralism and Marxism include phenomenology, policy sciences, evolution-sociobiology, etc. (I am not taking any claims to completeness or mutual exclusivity in this category list nor in others in this paper. My intention is a better classification schema -- one that makes clear, helpful distinctions between different types of interdisciplinary approaches.)

Probably the most prevalent and influential transdisciplinary approach in American social science is general systems theory. It has its own professional association, and many disciplinarians have attempted to imperialistically absorb it within their discipline -- both sure signs of its stature. Robert Williams, a student of general systems theory and especially its modern father, Ludwig von Bertalanffy, and its prolific current spokesman, Ervin Laszlo, has identified the six major tenets:

1. Nature is composed of a hierarchy of systems, each with a specific structure made up of certain maintained relationships among its parts and manifesting irreducible charac-

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teristics of its own.

2. Homologies or isomorphisms -- There are similar structural patterns up through the whole succession of physical, biological and social systems.

3. Similar developmental patterns are manifest throughout all of nature's systems. Evolution is toward order, integration, complexity and individuation and away from multiplicity and chaos.

4. Cybernetics -- Open systems are interacting wholes with inputs, throughputs and outputs of energy and information. Through negative feedback systems maintain a dynamic equilibrium. Coding (communication triggers), negative entropy (organization of energy from the environment in order to maintain the system) and equifinality (different development paths can lead to the same destination) are basic concepts in the cybernetic model.

5. Macrodeterminism -- Prediction of individual events is neither possible nor necessary, though general movements and state qualities of systems can be predicted.

6. Holism -- Systems are viewed as integrated wholes of their subsidiary components and never as mechanistic aggregates of parts in isolatable causal relations.[36]

Walter Buckley summarizes the advantages of the general systems thought model as a transdisciplinary approach in another set of six points:

1. A common vocabulary;
2. A means of understanding large, complex organizations;
3. A synthetic approach that keeps things together in their holistic contexts;
4. A focus on information and communication nets;
5. The study of relations rather than entities with an emphasis on process and transition probabilities;
6. "An operationally definable, objective, non-anthro-

pomorphic study of purposiveness, goal-seeking system behavior, symbolic cognitive processes, consciousness and self-awareness, and sociocultural emergence and dynamics in general."[37]

Of course, many of these advantages can be questioned, and some critics accuse general systems of possessing the very attributes which it professes to avoid. They call general systems mechanistic, overly cognitive, prescriptive, too structured, not translatable into available mathematical relationships, open to serious misuse by zealots, etc.

The most extensive and successful application of general systems to basic social science has been done by Alfred Kuhn.[38] As above, the basic model is the cybernetic system -- a controlled, feedback system with three components: detector (information), selector (preferences) and effector (action). Individual behavior can be analyzed within this formulation, as can interpersonal behavior in which detector equals communication, selector equals transaction and effector equals organization. Interpersonal components can be combined into social composites. "This volume uses a conceptual structure which sees the basic social science disciplines not as sociology, economics and political science, but as communication, transaction, and organization, approached through a base in system analysis."[39] Despite earlier hopes by Professor Boulding and others that college curricula would be revolutionized by Kuhn's herculean efforts, acceptance has not been overwhelming.

On the other hand, general systems as a conceptual approach enjoyed widespread influence across America in the sixties and seventies. It was the basis of the new approach to public budgeting introduced by the Kennedy administration and codified by President Johnson in the PPBS (Planning, Programming and Budgeting Systems) Executive Order, which influenced the planning and evaluation approaches to virtually all large organizations in the United States. The ecology movement also relied on general systems for much of the conceptual coherence in its intellectual case, though general systems itself incorporated some older ecological principles in its formulation.

Structuralism, another major transdisciplinary approach, shares some assumptions with general systems. These assumptions include the relatedness of all things, their organization into levels of isomorphic structures with laws of transformation, structures (or systems) manifesting homeostatic self-regulation and holism. But structuralists do not deal primarily with the empirical observables of systems, nor do they believe that the participants in them are necessarily aware of the latent structures which are influencing them. Structuralists look for the underlying formal structures, the deep structures, which they believe reflect the basic cognitive, biologically derived structure of human thought. They see these structures as binary oppositions, at times with mediators, such as hot-cold, me-other, raw-cooked, life-death, etc.

> The unconscious activity of the mind consists in imposing forms upon content, and if these forms are fundamentally the same for all minds -- ancient or modern, primitive or civilized (as the study of the symbolic function, as expressed in language, so strikingly indicates) -- it is necessary and sufficient to grasp the unconscious structure underlying each institution and each custom in order to obtain a principle of interpretation valid[40] for other institutions and other customs.

According to Professor Gardner, the structuralist position threatens the behaviorist and functionalist views which currently dominate Anglo-American social science, for not only does it rely on innate mental structures and non-historical, universal similarities but it also "finds no need to posit 'needs for' or 'functions of' structure."[41] The most important part and test of the structuralist method in Professor Deetz's view is the effort "to take logical permutations from a formulated structural unity and find empirical instances in widely varying situations which fulfill these possibilities."[42] Piaget, on several occasions, has suggested that structural analysis will provide the basis for eventual interdisciplinary integration.

Structuralism, especially the Levi-Strauss variety, has come under heavy attack from many quarters, including proponents of competing transdisciplinary apporaches such as Marxism. Marxism and structuralism differ in their starting premises, Marxism giving pre-eminence to the material forces of production in the formation of human societies, including its symbolic manifestations, whereas structuralists look to the deep structure in the human mind as influencing the eventual form of human customs and institutions.[43]

Yet Marxism shares certain assumptions with structuralism and even with general systems. They all share the assumption of the interrelatedness and interdependence of nature. Marxism shares a belief in progressively differentiating evolution with general systems, but the driving force and form of the process are different. Some of the basic principles of Marxism have been applied to nature in general, such as continuous change through quantitative accumulation leading to periodic qualitative revolutions, but essentially Marxism is a non-discipline-specific thought model for the study of human societies and history. There are Marxist schools of thought, small though they may be, in all social science disciplines in the United States.

Change is continuous, teleological and ineluctable. It proceeds through the dialectic of contradiction -- one state leads to its opposite and the contradiction between them produces a synthesis which immediately generates its opposite, and so on. In human history the state of technology determines a particular mode of production, which in turn determines a particular set of productive relations -- classes, pre-eminently one of owners and controllers of the means of production and one of workers and non-owners -- which have a necessary built-in contradiction. The struggle between the classes finally reaches a climax, at which point a revolution occurs and the next mode of production comes on the scene. In his simplest model Marx identified five major modes of production in all of human history: primitive communism, slavery, feudalism, capitalism and communism.

Thus, if a researcher undertakes a Marxist analysis, he or she directs attention to the peculiar manifestations of the elements mentioned above in the particular society under study.[44] For Marx these materialist conditions have an objective reality about which scientific laws can be discovered. In capitalism, the mode of production to which Marx understandably devoted most of his attention, the controlling class -- the bourgeoisie -- is able to extract an exploiting surplus value from the workers -- the proletariat -- because of the nature of the system. In order to protect this power of oppression, the bourgeoisie engage in all means of tactics to prevent the workers from becoming conscious of their shared exploited state, including the encouragement of bourgeois social science with status-quo-supporting thought models.

Sociobiology, one of the newest fads in transdisciplinary approaches, has been vigorously attacked by Marxists as yet another rationalization for capitalistic exploitation under the guise of scientific respectability. Sociobiology is the application of the principles of natural selection and evolutionist biology to the study of animal social behavior. It assumes that genes are selected out from a variable pool in interaction with the environment over time so that they provide for the maximum fitness to individual and kin survival and reproduction. This evolved genetic inheritance programs the possible range of human behavior, i.e.,

> the form and intensity of emotional responses and the more general ethical practices based on them, the thresholds of arousals, the readiness to learn certain stimuli as opposed to others, and the pattern of sensitivity to additional environmental factors that point cultural evolution in one direction as opposed to another. . . . The challenge to science is to measure the tightness of the constraints caused by the programming, to find their source in the brain, and to decode their significance through the reconstruction of the evolutionary history of the mind.[45]

The major spokesmen for sociobiology consider it the "new synthesis." "The only way forward is to study human nature as part of the natural sciences, in an attempt to integrate the natural sciences with the social sciences and humanities."[46] "No paradigm approaches natural selection in its ability to explain a wide range of behavioral phenomena among animals and none offers equivalent promise of cutting a clean swath through the morass of data and theory currently surrounding research on human behavior."[47] "The evolutionary epic is probably the best myth we will ever have."[48]

Biology's evolutionary model has been incorporated into social science before, in the form of social Darwinism at the turn of the century. Most social scientists would agree with Professor Boulding that the results were "almost catastrophic."[49] Evolutionary models have always been prevalent within anthropology, though the extent of their influence has varied. After World War II, with the emphasis on modernization studies, many disciplinarians began looking for evolutionary theory to explain the process of societal development that eventuated in industrialization. Though there were analogies to biological evolution, the basic thrust was cultural evolution as an adaptive form of behavior to a changing environment. The environment was primarily changed by increases in knowledge, accumulating energy control, and improvements in the technology of production. Cross-disciplinary efforts were undertaken, and some suggested "the increased usage of evolution as a holistic concept for handling the increasing data dealing with the question of how societies change."[50] However, the effort did not receive wide backing, and then sociobiology took over the stage. The cultural evolutionists are fighting back, and the drama of the competing world views goes on.

> Biology, while it is an absolutely necessary condition for culture, is equally and absolutely insufficient; it is completely unable to specify the cultural properties of human behavior or their variations from one group to another.[51]

The transdisciplinary parade could go on, but the above examples should suffice to demonstrate the nature of the category. It is a crucial category for interdisciplinarians, as it contains the contending synthesizing models. A curriculum in interdisciplinary social science is not complete if it does not include introductions to most of the major transdisciplinary approaches.

Thus we have three major approaches to interdisciplinary social science -- multi, cross and transdisciplinary. Multidisciplinary apporaches are limited to the juxtaposing of disciplines -- usually generated by the need to deal with some social problem. Cross-disciplinary approaches involve an effort at connecting and combining across disciplinary boundaries. I have suggested seven categories of cross-disciplinary activity: topical focus, professional preparation, life-experience perspective, shared components, cross-cutting organizing principles or concepts, hybrids and grand synthesis. Transdisciplinary approaches involve overarching non-discipline-bound thought models, of which I have discussed four examples: general systems, structuralism, Marxism and sociobiology.

Though no immutable quality is claimed for these categories, I would like to exclude from the last category one approach which has been labeled transdisciplinary. That is the approach which calls for "an all-encompassing philosophy of science that concerns itself with all essential aspects of all the sciences and disciplines."

> This unity is continually to be brought about and accounted for by those who actually engage in scientific research. These efforts will remain fruitless if we cannot first come to some agreement about the totality of meaning in which, in light of our Western tradition, we would like to live, and about the position that the sciences will have in that totality of meaning in addition to religion, morality, the arts, and our sociopolitical praxis. And this agreement cannot be brought about except by philosophical reflection.[52]

I cannot imagine a more impossible agenda to accomplish. The quest for the good life, for the solutions to all of humanity's problems, for a unified world philosophy, are all virtuous endeavors. An interdisciplinary background and orientation may be of assistance to those capable of making significant contributions, but they are ethical quests, not transdisciplinary endeavors as defined in this paper.

Finally, I must reiterate that the above scheme makes no claim to deep structural truth, nor to clarifying all of the confusing diversity in the disciplinary and interdisciplinary arena within the social sciences. In addition, the taxonomy is a static one; yet an interdisciplinary activity that is a multi-disciplinary approach at one period may evolve through various steps into a new discipline at a later date, or it may dissolve back into its constituents, or something else may happen.[53] Since the observable world of academic groupings is not composed of internally consistent, unchanging, homogeneous entities, one can never be entirely sure that where one has placed something through personal impression of chosen modalities will coincide with others' views. Nevertheless, it seemed worth a try to propose some order.

# # # # #

FOOTNOTES

[1] Bert Hoselitz, *Reader's Guide to the Social Sciences* (Free Press: New York), 1959, pp. 15-16.

[2] Quoted in William Kapp, *Toward a Science of Man in Society: A Positive Approach to the Integration of Social Knowledge* (Martinus Nijhoff: The Hague, Netherlands), 1961, p. 60.

[3] Thomas L. Haskell, *The Emergence of Professional Social Science* (University of Illinois Press: Urbana, Illinois), 1977, pp. 230-31.

[4] Quoted in Ernest Becker, *The Structure of Evil: An Essay on the Unification of the Science of Man* (George Braziller: New York), 1968, p. 95.

[5] Martin Landau et al., "The Interdisciplinary Approach and the Concept of Behavioral Science" in Norman Washburne, ed., *Decisions, Values and Groups* (Macmillan Company: New York), 1962, p. 12.

[6] Quoted in Kapp, *op. cit.*, p. 5.

[7] Raymond C. Miller, "Interdisciplinary Social Science and San Francisco State College," mimeo, 1969.

[8] Leo Apostel, et al., *Interdisciplinarity: Problems of Teaching and Research in Universities* (Organization for Economic Cooperation and Development, Centre for Educational Research and Innovation: Paris), 1972.

[9] Thomas Kuhn, *Structure of Scientific Revolutions*, (University of Chicago Press: Chicago), 1962, 1970.

[10] Miller, *op. cit.*

[11] Stanley Bailis, "The Social Sciences in American Studies: An Integrative Conception," *American Quarterly*, Vol. XXVI, No. 3 (August 1974), p. 206.

[12] "The Concept of the Structure of a Discipline," *Educational Record*, Vol. 43, No. 3 (July 1962), p. 199.

[13] Hugh G. Petrie in "Do You See What I See? The Epistemology of Interdisciplinary Inquiry," *Journal of Aesthetic Education*, Vol 10, No. 1 (January 1976), pp. 29-43, calls these make-sense patterns of disciplines "cognitive maps." They include basic concepts, modes of inquiry, what counts as a problem, observational categories, representation techniques, standards of proof, types of explanation and general ideals of what constitutes the discipline.

[14] Kuhn, *op. cit.*, pp. 174-210.

[15] "Why Interdisciplinarity?", *Interdisciplinarity in Higher Education* (Pennsylvania State University Press: University Park), 1979, p. 145.

[16] Professors William Newell and William Green of Miami University in Ohio, in the recently written, unpublished "On the Nature and Teaching of Interdisciplinary Studies," develop their ideas on discipline in a similar manner, including the use of the concept "world view."

[17] *The Little Community* (University of Chicago Press: Chicago), 1955, pp. 86-95.

[18] Edmund Leach, "Models of Man," in William Robson, ed., *Man and the Social Sciences* (Sage Publications: Beverly Hills, California), 1974, p. 169.

[19] "Discipline and Interdisciplinarity," in Apostel, *op. cit.*, p. 84.

[20] Newell and Green, *op. cit.*, p. 7.

[21] David Abbey, *Designing Interdisciplinary Studies Programs* (Board of Regents, New York State University: Albany), 1976; Apostel, *op. cit.*; Caroline Eckhardt, *Interdisciplinary Programs and Administrative Structure* (Pennsylvania State University Press: University Park), 1978; Joseph Kockelmans, ed., *op. cit.*; William Mayville, *Interdisciplinarity: The Mutable Paradigm* (American Association of Higher Education: Washington, D.C.), 1978; Richard Meeth, "Interdisciplinary Studies: A Matter of Definition," *Change*, Vol. 10, No. 7 (August 1978); and Geoffrey Squires et al., *Interdisciplinarity* (Nuffield Foundation: London), 1975.

[22] Pierre de Bie, "Multidisciplinary Problem Focused Research," *International Social Science Journal*, Vol. XX, No. 2 (1968), p. 200. For a full discussion of the problems of multi-disciplinary team research, see Margaret Baron Luszki, *Interdisciplinary Team Research: Methods and Problems* (The National Training Laboratories: Washington, D.C.), 1958.

[23] Max Millikan, *No Easy Harvest* (Little, Brown & Co.: Boston), 1967. p. v.

[24] *Ibid.*, p. xii, abridged version.

[25] Apostel, *op. cit.*, pp. 25-26.

[26] Stanley Cain, "Can Ecology Provide the Basis for Synthesis Among the Social Sciences?" in Morris E. Garnsey, ed., *Social Sciences and the Environment* (University of Colorado Press: Boulder), 1967, pp. 27-52.

[27] Lynn Ellingson, "Asking the 'Women' Question," unpublished manuscript, San Francisco State University, p. 3.

[28] Heckhausen, *op. cit.* p. 87.

[29] Donald Campbell, "Ethnocentrism of Disciplines and the Fish Scale Model of Omniscience," in Sherif & Sherif, eds., *Interdisciplinary Relations in the Social Sciences* (Aldine: Chicago), 1969, p. 337.

[30] Bailis, *op. cit.*, p. 207.

[31] Joseph Schwab, *College Curriculum and Student Protest* (University of Chicago Press: Chicago), 1969, p. 241.

[32] Jack Mitchell, *Social Exchange, Dramaturgy and Ethnomethodology: Toward a Paradigmatic Synthesis* (Elsevier: New York) 1978.

[33] Irving Louis Horowitz, *Three Worlds of Development* (Oxford University Press: New York), 1972, p. ix.

[34] Bailis, *op. cit.*, p. 205

[35] Book Review of D.C. Phillips, *Holistic Thought in Social Science* (Stanford University Press: Stanford, California), 1976, delivered at the Behavioral and Social Science Book Forum, San Francisco State University, May 3, 1978.

[36] Robert Williams, "Pillars of the Temple: A Brief Appraisal of the Various Elements of the General Systems Paradigm," unpublished manuscript, 1973; Ludwig von Bertalanffy, *General Systems Theory* (Braziller: New York), 1968; and Ervin Laszlo, *The Systems View of the World* (Braziller: New York), 1972.

[37] Walter Buckley, *Sociology and Modern Systems Theory* (Prentice-Hall: Englewood Cliffs, New Jersey), 1967, p. 39, as quoted in Jack Mahan, *Toward Transdisciplinary Inquiry in the Humane Sciences*, unpublished dissertation, United States International University, San Diego, California, 1970, p. 145.

[38] Alfred Kuhn, "A Manifesto for System-Based Unified Knowledge," *Association for Integrative Studies Newsletter*, No. 1 (September 1979), and his three books, *The Study of Society: A Unified Approach* (Irwin-Dorsey: Homewood, Illinois), 1963; *Unified Social Science* (Dorsey Press: Homewood, Illinois), 1975; and *The Logic of Social Systems* (Jossey-Bass: San Francisco), 1974.

[39] Kuhn, *Unified Social Science*, p. vi.

[40] Levi Strauss as quoted in Jean Piaget, *Structuralism* (Harper & Row: New York), 1971, pp. 110-11.

[41] Howard Gardner, *The Quest for Mind* (Random House: New York), 1974, p. 221.

[42] Stanley Deetz, "Structuralism: A Summary of Its Assumptive and Conceptual Bases," *Review of Social Theory* (April 1973), p. 163.

[43] Gardner, *op. cit.*, pp. 222-23.

[44] Irving Zeitlin, "Marx's Paradigm for an Analysis of the Structure and Change of Whole Societies," *Marxism: A Re-Examination* (D. Van Nostrand Co.: New York), 1967, pp. 152-55.

[45] Edward O. Wilson, *On Human Nature* (Bantam Books: New York), 1979, pp. 6 & 49.

[46] *Ibid.*, p. 7.

[47] David P. Barash, "Evolution as a Paradigm for Behavior," in Michael Gregory et al., eds., *Sociobiology and Human Nature* (Jossey-Bass: San Francisco), 1978, p. 32.

[48] Wilson, *op. cit.*, p. 209.

[49] "Sociobiology or Biosociology," in Gregory, *op. cit.*, p. 272.

[50] Claude S. Phillips, Jr., "The Revival of Cultural Evolution in Social Science Theory," *The Journal of Developing Areas*, Vol. 5, No. 3 (April 1971), p. 338.

[51] Marshall Sahlins, *The Use and Abuse of Biology: An Anthropological Critique of Sociobiology* (University of Michigan Press: Ann Arbor), 1976, p. xi.

[52] Kockelmans, *op. cit.*, pp. 151 & 153.

[53] Raymond C. Miller, "President's Task Force on Interdisciplinary Studies," mimeo, San Francisco State University, 1979.

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FIVE ARGUMENTS AGAINST INTERDISCIPLINARY STUDIES

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In our enthusiasm and occasional defensiveness concerning interdisciplinary studies, we sometimes fail to listen carefully to the arguments of its numerous opponents. Instead of attending to the diverse charges and criticisms, it is tempting to concentrate on the strengths and merits of interdisciplinary studies -- presumably on the assumption that well-articulated pluses will cancel the alleged minuses. After all, there is no defense like a good offense. This inattentiveness to the substance of the criticisms of interdisciplinary studies is not without its consequences. Not only do we squander opportunities to respond effectively to arguments that rest upon correctable misperceptions of interdisciplinary studies, but we also neglect potentially valuable instruction concerning our weaknesses.

In this brief paper, I shall identify five of the most popular arguments against a substantial role for interdisciplinary studies in the undergraduate curriculum. Each argument will be sketched in broad terms, with no attempt made to defend interdisciplinary studies from the respective charges. Call this, if you will, a bit of enlightened devil's advocacy. The temptation to respond to the diverse arguments has been checked, not for want of inspiration, but in keeping with the stated purpose of the paper: to focus attention on the nature of the arguments against interdisciplinary studies. It is clear that there are some important arguments against interdisciplinary studies neglected in my brief inventory. Those that I have included, however, strike me as being at or near the top of the list in popularity and forcefulness.

The first argument against interdisciplinary studies is that it rests upon serious conceptual confusion. Quite simply, the practitioners of interdisciplinary studies lack a coherent, defensible sense of their purposes. Interdisciplinary studies purports to be concerned with examining and developing significant lines of connection between two or more disciplines. It is not at all clear, however, just what it means to connect the disciplines nor what the value of such activity might be. Most of the discussion of interdisciplinary or integrative studies assumes clarity in these matters and moves on to other concerns. Part of the difficulty here might be thought to derive from the notorious uncertainties surrounding the nature of the disciplines themselves. Seen in the worst light, integrative studies is a fool's project, propounding equations where all the terms are unknown. Things are not quite this bad, however, and although the arbitrary hands of chance and politics have played important roles in the definition of the disciplines,[1] their latter-day contours and boundaries turn out, on the whole, to make surprisingly good sense. Each of the disciplines offers us some general criteria for locating questions inside or outside of its boundaries. For the most part, the boundary lines among the disciplines are drawn by means of appeal either to a distinctive subject matter or to a distinctive method of inquiry. There is, of course, nothing perfectly neat or grayless in such boundary demarcations; but most of the problems are confined to marginal cases and relatively minor "turf" disputes. The lack of clarity associated with integrative studies cannot be excused, then, as derivative from the underlying vagueness of the concept of the disciplines.

If the connection among the disciplines contemplated by integrative studies is nothing more than a matter of borrowing insights or methods from one or more disciplines to illuminate problems in another, it seems fair to ask why such extra-curricular borrowing is called "integration." The concept of integration suggests a more substantial and enduring bond than that involved in the paradigms of integrative studies. Indeed, the proponents of integrative studies seem unwilling to regard the envisioned connections among the disciplines as forming a permanent bond. The disciplines are not dissolved in the transactions of integrative studies. Moreover, the kind of borrowing suggested in the proposed account of integrative studies already occurs routinely within the framework of most disciplinary activity. The physicist is lost without the tools of mathematics; the political scientist borrows insights from sociology, history and economics; the literary studies scholar makes use of the methods of linguistics and analytic philosophy. There is nothing special about this import/export business across disciplinary lines; and it hasn't occurred to anyone to call the process integrative or interdisciplinary. Clearly, the proponent of integrative studies owes us a better account of the nature of the integration he contemplates, one that is, at once, coherent and non-trivial.

In addition to demystifying the nature of the disciplinary connections he seeks, the proponent of integrative studies should be prepared to articulate more fully the principle or principles that determine when these connections are to be sought. The disciplines, as we have noted, are guided by broad, internal standards of relevance, whether that of distinctive subject matter or of method. But what principles guide the integrative studies practitioner in choosing to make these connections rather than those? Is he responding to some larger teleological sense of the natural connectedness of things or is his motivation essentially pragmatic, stimulated by what he sees as theoretical or practical impasses within specific disciplines? There appears to be no agreement among integrative studies advocates in this matter. Some talk about a grand holistic scheme and the unity of knowledge, while others speak more modestly about the practical value of interdisciplinary projects in the solving of specific problems. Still others see the applications of integrative studies as primarily centered in instruction rather than research. However sharp the contrasts here, the diverse options tend to be discussed with a characteristic air of romance and all too little rigor and specificity. For all of their worried criticism concerning the dominance of the disciplinary model in higher education and their curative ambitions, the proponents of integrative studies have given surprisingly little attention to the important work of defining their goals and their methods clearly. The consequences of this neglect can be seen both in the lack of reliable traditions and literature concerning interdisciplinary studies teaching and in the widespread doubts about the intellectual foundations and value of integrative studies.

A second argument against interdisciplinary studies holds that it is a *pedagogically doubtful business to spend time in interdisciplinary learning projects when the student lacks a mature base in any of the contributing disciplines*. Sound educational development requires proper background and critical participation on the part of the student. Having no firm hold on any of the associated disciplinary traditions, the student in an interdisciplinary studies course or curriculum can be little more than a spectator to the marshalling of arguments, methods, and insights from the diverse contributing disciplines, with their voluminous literature and often highly technical research traditions. However exhilarating the discussion, the interdisciplinary studies course promises little in the way of long-term benefits for the student. *If* integrative studies are to be pursued properly and have lasting value, the student must *first* acquire a strong foundation in at least one of the contributing disciplines. This suggests that substantial involvement in integrative studies should be deferred to a point relatively late in the undergraduate career. And, even at this point, given the demands associated with the acquisition of disciplinary competence, it is likely to be of doubtful value.

Undergraduate programs in interdisciplinary studies appear fated to wander between two unattractive poles -- either they assume disciplinary sophistication in the students, in which case most, if not all, of the students are left in the dark, unable to manipulate the central issues at stake or -- and this is much more frequently the case -- they assume little, and the program of study is diluted and homogenized to the point where it is almost totally devoid of a critical base. Under the guise of an invitation to wrestle with what are frequently fascinating and important issues, the student is cheated of a precious opportunity to develop the skills and background required for mounting a proper attack on the issues. As Robert Paul Wolff has noted in *The Ideal of the University*, undergraduate courses in theoretical economics and logic may well do more to prepare students for grappling with the socio-political crises of their time than interdisciplinary seminars on poverty and the philosophy of war.[2]

We are facing a growing crisis in the planning and politics of the undergraduate curriculum. The explosion of knowledge in the disciplines is leaving less and less time for study outside the student's major disciplinary program. On many campuses, the requirements for major programs in mathematics and the natural sciences constitute as much as 2/3's of the student's academic program. Although a backlash in favor of stronger liberal arts distribution requirements has appeared on some campuses, it is difficult to see how the tide of early and intensive specialization in a disciplinary area can be resisted. Adequate preparation for graduate and professional study and for careers in the disciplinary area requires increasing amounts of course work in the major program.

On this account, a third argument against interdisciplinary studies has acquired heightened importance. It is argued that a substantial commitment to integrative studies in the undergraduate program will impede the student's development of an essential disciplinary competence.

However attractive the ideal may be in the abstract, there simply is not enough time within the traditional four year, 120 credit framework of undergraduate education to do all of the things that our educational ideals suggest. We are being forced with increasing urgency to cut corners, to choose the lesser from among a number of curricular evils. Whatever sacrifices we make, it seems clear that we cannot forfeit the development of sound, critically based disciplinary competence. Such competence is best fostered in the rigorous and orderly pursuit of a well-designed sequence of disciplinary courses. The idea that disciplinary competence can be acquired in the midst of a substantial commitment to a program of integrative studies is so much wishful thinking -- given the time, energy, and learning abilities of most undergraduate students. Of course, a proper regard for the liberal arts ideal requires some learning experiences beyond the disciplinary concentration. Here it seems preferable to introduce the undergraduate to the foundations, the essential concepts, methods and traditions of a range of disciplines through undiluted, introductory level courses. Rather than teasing a student with fragmentary exposure to philosophy and literary studies in an interdisciplinary course in philosophy and literature, let him take a rigorous course in the classics of Western literature and/or a challenging introductory course in philosophy.

The primary responsibility of the university, given the premium on time and study opportunities, is to equip the student with adequate foundations for future growth and development. Although a course here and there along the way in interdisciplinary studies may make sense for some students, such activity should be kept to a minimum and pushed to the margins of the college agenda. Interdisciplinary studies opportunities on a more substantial scale are best left to extracurricular agencies, e.g., community forums, topical conferences and institutes, and continuing education programs.

The cultivation of competence in a particular discipline is not just a matter of educational ideals, it is also, increasingly, a matter of practical importance. Students seeking admission to graduate school and entry to highly competitive career areas are faced with requirements and expectations that stress close identification with and substantial development in a particular disciplinary tradition. However arbitrary and unfair such standards may be, they are part of the post-graduate world to which the student must adapt. Students must be advised of these expectations and assisted in finding a sensible pattern of response. It is unconscionable for interdisciplinary studies faculty to use students as unwitting flag bearers for their dreams of educational reform. To be sure, there are student aspirations and career plans that can be adequately served by undergraduate programs concentrating in integrative studies. For most students, however, the price of concentration in integrative studies, with the attending neglect of a disciplinary base, will be the risk of disqualification from coveted graduate school and job opportunities.

Among the more popular arguments directed against interdisciplinary studies programs none is as widely subscribed as the charge that integrative studies courses are characteristically shallow, trading intellectual rigor for topical excitement.[3] This fourth argument has special currency among academic traditionalists who are instinctively suspicious of any course that sounds remotely "relevant" or of popular interest, and among rivals in the disciplinary departments who are sensitive to what they see as naked marketing ploys in the escalating competition for student registration. Some of it, however, issues from a genuine concern for academic integrity and what might be called truth-in-teaching standards. Student enrollment response to an appealing seminar theme and even favorable student course evaluations are not necessarily the best measures of the worth of a course. The emphasis in contemporary mass media on "big picture" treatment of broad themes has stimulated a demand in the academic market for comparably wide-angled course offerings. Some integrative studies faculty play to this vogue with results that can only re-inforce the hostile stereotypes of the interdisciplinary studies course. Although there are, to be sure, many demanding and intellectually rich programs and courses focusing on attractive topical issues, there are simply too many interdisciplinary studies faculty driving curricular ice cream trucks down the academic alleys.

Not only are many of the "big picture" integrative seminars ill-conceived, but there is also a disturbing tendency for such courses to be taught in a sloppy, chat-in-the-round fashion that does little to cultivate either critical skills or a systematic grasp of the issues under review. The pedagogical deficiencies in these courses are frequently compounded by a heavy reliance on splashy special events: guest speakers, films, video-cassettes, and other classroom equivalents of easy-listening radio. Instead of a carefully planned, intellectually demanding mix of lectures, sharply focused discussions, exams, and papers, the student is exposed to a semester long variety show, doubtless interesting, but of very little long term educational value. Moreover, even where there are adequate measures of order, method, and rigor in the integrative studies seminar, the theme often fails to "pan out." The anticipated synthesis fails to materialize. In such cases, some may wish to write the seminar off as a noble experiment that failed. Such failures are so common, however, as to raise serious questions about the judgment and, still worse, the integrity of many interdisciplinary studies teachers. It is irresponsible to use students as semester-long guinea pigs in the testing of what are frequently half-baked notions of curricular value. As the popular television spots for the Black colleges insist: "A mind is a terrible thing to waste."

A fifth argument against interdisciplinary studies programs focuses on the relatively high cost of the typical integrative studies course. In a time of embattled budgets and overburdened academic resources, it is argued that the interdisciplinary studies programs, with their heavy reliance on team-teaching methods, special events, independent study, and relatively low faculty-student ratios, are extravagant and cost ineffective. It is assumed that the interdisciplinary studies programs cannot accomplish their goals without substantial resort to such expensive practices. The integrative studies programs are not charged with profligacy, but rather with a lack of redeeming educational value, sufficient to offset their hefty price tags. Proponents of this argument also note that many interdisciplinary studies programs place further burdens on severely limited academic budgets by either borrowing adjunct teachers from the disciplinary departments, creating thereby a need for part-time replacements, or by hiring their own psychologist or sociologist or historian, etc., and thus duplicating -- albeit with dubious quality control -- the faculty resources already availabe in the departments.

There are additional complaints about interdisciplinary studies worth examining; e.g., there is the claim that integrative studies faculty are, for the most part, second-class scholars, exiles and refugees from the disciplinary departments, where they either failed to measure-up or found themselves incapable of sustaining the kind of rigor and focus required for success in disciplinary scholarship. However painful the project, it would be a useful service to integrative studies to identify these additional arguments. It would also be helpful to examine the criticisms of interdisciplinary studies in an historical light and with a view toward the discovery of both patterns of frequency and the correlations between particular arguments and the disciplinary base of their proponents.

Beyond the extension of the list of significant criticisms of interdisciplinary studies and the varieties of analysis suggested above lies the important and difficult work of responding to the arguments, both intellectually and politically. In meeting this challange, it will not suffice simply to impart what we already know. Clearly, we need to know more. We need to think more fully and critically about the logical foundations of integrative studies. We need to develop more compelling justifications for including substantial integrative studies work in the ever more crowded undergraduate curriculum. We need to articulate more fully the connections between disciplinary work and interdisciplinary studies in the realization of the liberal arts ideal. We must cultivate and give increased attention to post-graduate study and career opportunities for students concentrating in integrative studies. We must place a greater emphasis on rigor and learning that lasts in the design and teaching of interdisciplinary studies courses; and, finally, we must give more urgent attention to program economies that will allow integrative studies work to continue, while not sacrificing the unique values and traditions that have distinguished our work.

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NOTES

[1] Cf. Frederick Rudolph, *The American College and University* (New York, 1962), pp. 399-400.

[2] Robert Paul Wolff, *The Ideal of the University* (Boston, 1969), pp. 78-79.

[3] Cf. Christopher Jencks and David Riesman, *The Academic Revolution* (New York, 1968), p. 498.

WHAT ARE TRANSDISCIPLINARY PRINCIPLES?

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My thoughts today are going to be focused on that aspect of interdisciplinarity known as transdisciplinarity (TD). TD attempts to explore directly into the nature of those connections which exist when underlying similarities are perceived across diverse subject matter. In a broad sense all of our interdisciplinary efforts and activities seek to further our understanding of the interconnections between the various fields of knowledge. These efforts may be ordered hierarchically according to the extent of interconnection pursued.

At the top of this interdisciplinary hierarchy is the level of transdisciplinarity which is built on the premise that there are discernable principles and purposes which underlie the entire knowledge/knower system. In the opinion of many leading thinkers, including Jean Piaget, who has written on the epistemology of interdisciplinary relationships, our best efforts as interdisciplinarians must be focused on this top structure of the system. In the following excerpt from his essay on the *Objectives and Nature of Interdisciplinary Studies*, K.F. Mather captures the essence of the rationale for a transdisciplinary approach to the integration of the liberal arts curriculum:

> ...important is the search for basic concepts and underlying principles that may be valid throughout the entire body of knowledge, that

> serves as the common roots from which the various branches draw their vitality....integrative studies for general education must involve the quest for basic concepts and underlying principles. Such studies must go down to the very roots of the tree of knowledge; they must deal with the structures of the universe and its fundamental directives.[1]

This approach seeks not only a common axiomatics underlying all knowledge, but coordination of the entire educational system towards an overall system purpose inclusive of human meaning and values. In the words of Professor Erich Jantsch:

> We arrive here at the same crossroads as in all attempts to view whole systems and aim at their improvement: we lack a deeper understanding of purpose, and thus an unambiguous direction for our organizational efforts. Nevertheless, we cannot hope to act with a true purpose--in other words, to manage the multi-level multi-goal education/innovation system in a meaningful way--if we do not search for and bring into play values and norms, a policy for mankind, to guide education and innovation. Our best efforts must therefore focus on the top structure of the system.[2]

The goal of the transdisciplinary (TD) effort is thus twofold: to unite the disciplines on the level of common underlying principles and on the level of their commonality as expressions of purposeful human behavior.

TD and General Criticisms of Integrative Studies

When successful, the TD approach circumvents some of the possible criticisms of interdisciplinarity suggested in the accompanying article by Dr. Thomas Benson on *Five Arguments*

Against Interdisciplinary Studies. Three of the often cited shortcomings of interdisciplinary programs discussed by Professor Benson are: "(i) integrative education often rests upon serious conceptual confusion, (ii) it can be inappropriate, given the students' lack of mature disciplinary insight, (iii) a substantial commitment to integrative education can impede the students' development of disciplinary competence."

As an approach to interdisciplinarity, TD is unique in that it maintains the integrity of traditional disciplinary boundaries, thereby avoiding the latter two of the above dangers. Its emphasis is on the illumination of metaconcepts which transcend the disciplines, thus eliminating the need to reorganize curriculum in ways which weaken or dissolve disciplinary boundaries. TD could therefore provide an administratively practical means to introduce an interdisciplinary perspective into an existing discipline-based general education program without a major effort at curricular reform. The addition of a single TD oriented course could provide ample opportunity for students to search out and apply overarching principles that connect the various fields they are studying. Such a course could be expected to have an impact on the entire intellectual community, as the unifying ideas introduced in it spread by means of student questioning and discussion.

Unfortunately, TD is more subject than any other interdisciplinary effort to the first of the forestated shortcomings: conceptual confusion. Unifying principles are elusive and hard to define. And it is not without some justification that such principles have been criticized as being imprecise and even simplistic. This is the reason that the TD perspective favored by so many scholars has not found practical application on a broad scale.

Epistemological Considerations

At this point we come face to face with the question I have taken as the title for these remarks: What are transdisciplinary principles? One way of responding to this question would be by collecting long lists of fundamental postulates drawn from systems theory, structuralism, mathematics, physics, psychology, and any other body of knowledge with substantive theoretical underpinnings generalizable beyond their own domain.

Personally, I am sympathetic to such an endeavor and would even take the radical step of advocating a search for commonalities across perspectives on a grand scale.*

It is a concern, however, that an unintegrated assemblage of candidate TD principles taken out of context, would not contribute much to the resolution of our question. A better approach will be to identify some of the fundamental assertions which can be made about the epistemological status of TD principles. This will lay bare the assumptions which underlie my own TD philosophy and, hopefully, raise for discussion several issues which deserve to be more carefully explored. The following then are my own views on three questions which must be addressed in the process of developing a transdisciplinary philosophy.

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*The theme of growing parallelism between the postulates of modern science and the classical religio/philosophic world view is already well established in our culture. Philosopher/scientists of the highest calibre have suggested that the insights of the modern sciences are so advanced they could be used to restore our shrunken contemporary knowledge paradigm to a vision more in keeping with its holistic roots (Eddington, 1935; Kunz, 1975; Schrodinger, 1967). An exploratory effort to interrelate advanced themes of the sciences, arts, humanities, and various integrative perspectives could help to define the shape of this impending synthesis.

1. Are transdisciplinary principles descriptive of patterns functioning which really exist in nature?

In the literature one reads about the need to "invent" interdisciplinary principles and "create" connections across the various fields of knowledge. The implications of such terminology are somewhat unclear. It is sometimes used in a context which suggests that transdisciplinary perspectives are only tools whose value is purely pragmatic and should not be taken as descriptions of phenomena which are "out there" in nature. Nothing could be further from the spirit of scientific inquiry. All of science rests on the assumption that there is an inherent orderliness in nature which is knowable by man. Without such an assumption science would be impossible. The attitude of the scientist has traditionally been more rationalistic and theoretical than empiricist and applied. In other words, their perceived task is simply to describe in ever more comprehensive and precise terms those patterns of behavior and causal relationship in nature which are immutable and eternal.

Bertrand Russell, speaking of mathematics as the language of science, captures the essence of this rationalist spirit:

> Too often it is said that there is no absolute truth, but only opinion and private judgement; that each of us is conditioned in his view of the world, by his own peculiarities, his own tastes and bias; that there is no external kingdom of truth to which, by patience and discipline, we may at last obtain admittance but only truth for me, for you, for every separate person. By this habit of mind, one of the chief ends of human effort is denied, and the supreme virtue of candour, of fearless acknowledge-

> ment of what is, disappears from our moral vision. Of such scepticism mathematics is a perpetual reproof; for its edifice of truths stands unshakeable and inexpugnable to all the weapons of doubting cynicism.[3]

A similar spirit can be readily attributed to the arts and humanities. It is a fundamental premise of the humanities that they deal with a higher form of knowledge than that which is accessible to the sciences. Their methods correspondingly differ from the sciences in that they are more evocative than descriptive, more metaphoric than analytic. But their goal is similarly to communicate the experiences of life. And the more universal and enduring of these experiences have traditionally been the most valued.

What then is the purpose of the formulations of inter- and transdisciplinary? Are they only tools whose value is limited to what is technical and applied? Or are they manifestations of our own best efforts to describe integrative principles as real as any of those described by the sciences? I believe the latter position reflects our true responsibility. For we are free to draw from innumerable perspectives, to explore, describe, evoke, and authenticate--by whatever means we deem most appropriate, those patterns of wholeness which are so very real in man and nature.

2. Are TD principles less precise than scientific principles? If so, how can this imprecision be justified?

When formulating TD principles we are forced to accept trade-offs between precision and comprehensiveness. If we favor precision, then our descriptive and manipulative power is increased, but at the cost of reducing the range over which the principle is applicable. If we favor comprehensiveness, then insight is gained into a broader range of interaction, but at the expense of precision.

As an example of this dynamic, let's consider the case of four professors having breakfast. The first professor, a linguist, is explaining the "The Theory of Least Effort" in linguistics. This theory, or principle, can be stated as follows: language changes tend toward assimilations and other modifications that require least effort for the speaker. This is a formulation which no doubt has considerable explanatory power in the domain of linguistics. Now our second professor, a psychologist, reciprocates by explaining a principle about the organization of memory, which states that the mind naturally finds the simplest way of coding information in memory.

The two professors are struck by the similarity between these two principles and set out to formulate an over-arching principle capable of covering both cases. This is accomplished with a minimum loss of precision because of basic similarities in the subject matter, method and language of the two disciplines. Now a physicist, who can no longer resist joining in on the discussion, bursts forth with the information that a first order principle of physics (a principle which has no exception) states that objects always follow the path of least resistance. When asked to describe in more detail how this principle functions in his discipline, the physicist replies as follows: $P(t)=C_0+C_1 \text{ x } t - 16 \text{ x } t^2$. This formula precisely describes the path of a thrown ball arching in accord with the mathematical principle of least action. Our three friends become temporarily confused. On one hand they are excited by the element of commonality they have discovered and wish to develop it further. On the other hand they have come upon fundamental differences in language, method, and subject matter which must be overcome before they can proceed. This is achieved only through a surrendering by all the parties, but especially the scientist, of certain elements of their training as professionals in their respective disciplines.

They finally agree on the following wording for a TD principle which covers all three examples: natural efficiency involves following the most direct path. The physicist, however, is concerned that something worthwhile may be left out in such a vague and imprecise statement. He turns to the biologist in search of a fourth opinion. Her reply is that the principle they have come up with beautifully expresses one of the most fundamental concepts in her field, i.e., that natural selection automatically favors organisms that are most efficient. Stimulated by the thread of commonality they have discerned, they collectively wonder what more their colleagues in other disciplines could add to this discussion. They agree that there are times when it is worthwhile to surrender specificity in favor of comprehensiveness.

Other transdisciplinary principles and samples of disciplinary concepts which they might encompass include:

1. The interdependence of part and whole

Physiology: As the science of human physiology advanced, the attempt to study the function of each organ in isolation gave way to the study of integrated biological systems.

Math: To know the value of a digit such as 10,373 we must know not only the value of each individual symbol but also their relationships to one another.

2. Adaptability on the basis of underlying stability

Genetics: The genetic code of the African tree lizard has remained stable for thousands of years except for modest changes brought about by adaptation to changing environmental conditions.

Law: Twenty-six amendments have been added to the original U.S. Constitution without altering a single basic precept.

3. Inner as the basis of the outer

Chemistry: The chemical burning of deuterium yields 82 ergs of energy per gram. The atomic fission of deuterium yields several million ergs of energy per gram.

Psychology: Freud held that a single insight into the workings of subconscious processes could free one from a lifetime of compulsive behavior.

4. The principle of homeostasis

Psychology: People presented with facts which threaten deeply held values tend to reject such information for psychological reasons.

Physics: The spring in a weighing scale returns to its original position when the two pounds of apples placed on it are removed.

5. Maintenance of inner stability amid outer change

Zoology: Warm blooded animals have physiological mechanisms for maintaining stable body temperature under varying climatic conditions.

Linguistics: Through the use of repetitious phrasing, cultures which transmit knowledge through oral traditions compensate for errors in transmission.

6. The facilitation of change by a non-involved agent

Chemistry: Invertase, an enzyme which catalyzes the breakdown of sucrose to glucose and fructose, accelerates metabolic activity while remaining virtually unchanged in the process.

Psychology: In Rogerian counseling the counselor maintains a non-directive attitude yet assists the client in making choices supportive of personal growth.

7. Structure and function as complementary

Biology: The left side of the heart which pumps blood throughout the entire body has a thicker musculature than the right side which only pumps blood to the lungs.

Poetry: In Haiku poetry, the unique structure of the poetic form is an integral part of the mood and message it conveys.

It will be argued that under certain circumstances both precision of language and a broad interdisciplinary vision can be sustained. Systems theory with its incredibly broad encompassment and somewhat precise terminology could be cited as an illustration of this. I agree and think that for addressing certain questions, systems theory is probably an appropriate discipline. But the point is that it is a discipline. It comes complete with experts, its own sophisticated language and structure of thinking--and also has been found more or less incomprehensible to many an intelligent layman.

For TD principles to be truly comprehensive, they should also be generally comprehensible. This is in keeping with Earl J. McGrath's provocative definition of inter (between) disciplinarity (the disciplines) as that which is literally between the disciplines; namely, the common language and experience of daily life. There is something ironic and not at all far fetched about the image of the advocates of two great integrative approaches, say a systems theorist and a Gestaltist struggling to communicate with each other. My own bias is that it should be possible to develop transdisciplinary principles which are formulated in plain English, are meaningful for virtually every discipline, and are completely open ended in their application. Such principles will, however, of necessity lie closer to the artistic end of the continuum which runs between statements which are precise and descriptive and those which are general and evocative.

If people can't verbalize their integrative insights in precise terms, that doesn't necessarily imply that the insights themselves are vague. Indeed, such experiences are often described as having a revelatory or "AHA" quality, which is hardly the characteristic of vague understanding.

According to Michael Polanyi the inability of otherwise articulate people to describe the content of integrative experience is an example of what he calls "the tacit dimension" of human experience. This is the dimension in which Polanyi says we literally "know more than we can tell." For example, we know a person's face, and we can recognize it among a thousand, indeed a million, others, but we usually cannot tell how we recognize a face we know. In Polanyi's analysis the transformation of particulars into coherent wholes is dependent on this tacit dimension of knowing. This integration is achievable only through a process of "interiorization" or "indwelling" in which the mind recedes from the level of explicit particulars and attends to the tacit dimension. Therefore, for Polanyi, "The belief that, since particulars are more tangible, their knowledge offers a true conception of things is fundamentally mistaken."[4]

Analytic thought, of course, is to be valued, for as Polanyi points out, a knowledge of the laws of metrical structure may deepen our understanding of so delicate a thing as a poem. His main theme, however, most fully expounded in his book *Personal Knowledge*, is that tacit thought forms an indispensable part of all knowledge. It is a well documented vision of personal non-cognitive, integrative elements of knowledge at the basis of all our explicit expressions and formulations of knowledge. Such a perspective will perhaps enable us to better understand the significance for inter and transdisciplinarity of that category of human experience described as transcendental or illuminative.

3. What are the implications for inter and transdisciplinarity of the human capacity to experience transcendence?

The human capacity for transcendence has been a theme of philosophy and literature for thousands of years. Aldous Huxley identified the experience of transcendence as the central characteristic of what he called The Perennial Philosophy. Although such experiences have usually been couched in the language of religion and metaphysics, psychologists and occasionally educators, have more recently attempted to study this phenomenon in an empirical and naturalistic way. Such studies are empirical in that they consistently appeal to human experience, and naturalistic in that no recourse is made to supernatural causes or interventions. The descriptions of the experience of transcendence which emerge from objective study of this phenomenon are, as Huxley noted, surprisingly consistent. The following is a composite definition drawn from the writing of Aldous Huxley, Abraham Maslow and Philip Phenix: The term "transcendence" refers to the experience of limitless going beyond any given state or realization. (Phenix) It is an experience that is attested to, often in paradoxical form, because the experience is said to be one of the oneness, such that it resolves the polarities of time and space, yet the reporter must characterize the experience in terms of time and space. (Huxley) It is not simply openness-in-general, but a cognition of being and the characteristics of being: truth, goodness, beauty, wholeness, aliveness, perfection, justice, etc. (Maslow) It is not an experience at all in the sense of involving subject/object dichotomy. It is a state of self immanent, awareness, unbounded by any object of experience.

The most notable of those to explore the topic of transcendence empirically was Abraham Maslow who spent much of his career studying the lives and experiences of what he called self-actualized people. He found that what was most strongly characteristic of highly developed people was their tendency toward transcendence. He referred to such people as "transcenders" and to their experiences as "Being-state cognitions" or "peak experiences." The tendency toward a unity or wholeness of understanding and experience of their surroundings, was found by Maslow to be so characteristic of these people that he used the term "unitive consciousness" to describe their state of awareness. He also observed in self-actualized people a style of perceiving which he referred to as Taoistic perception. This concept is described in the following passage taken from Maslow's preface to the second edition of *Religion, Values and Peak Experiences*.

> The perceiver can more readily look upon nature as if it were there in itself and for itself, not simply as if it were a human playground put there for human purposes. He can more easily refrain from projecting human purposes upon it. In a word, he can see it in its own Being (as an end in itself) rather than as something to be afraid of or something to wish for or to be reacted to in some other personal, human, self-centered way.[5]

Notice that the ability Maslow describes here seems to be an expanded form of Polanyi's concept of indwelling. Whereas indwelling is conceived by Polanyi as an entering into an individual object of knowledge or art, so as to more fully understand the mind of its creator, Maslow expands the concept into a seeing into the Being of nature. This is parallel to the idea that transcendence is a deep and more generalized form of indwelling.

Our brief references thus far to the process of indwelling and its logical extension, transcendence, deepen our perspective into the mechanics of creative insight. Whereas it is generally understood only that creativity requires a period of passive incubation, our analysis suggests that the quiescent mind possesses a dynamical integrative power. It is this power which acts upon our learned structure of ideas and experiences to produce creative insight. In this view one can culture or stimulate but not "teach" an integrative perspective. In the following excerpt from a book summarizing the conclusions reached at the conference on interdisciplinary college teaching, Guy Michard captures this perspective:

> I hope that the reader of this book understands that inderdisciplinarity cannot be learned or taught, for it is a way of life. It is basically a mental outlook which combines curiousity with open mindedness and a spirit of adventure and discovery; and it also includes the intuition that relationships exist between all things that escape current observation.[6]

At this point, we can focus down more sharply on the relationship between transcendence and transdisciplinarity and address the following question:

3A How can the study of transcendence improve our ability to formulate and apply transdisciplinary principles?

One answer to this question is suggested by Abraham Maslow's attempt towards the development of a psychology of being. On the basis of extensive observation and interaction with self-actualized people, Maslow compiled a list of what he called "fourteen values or characteristics of being," also referred to as "descriptions of the world as perceived in peak experiences."[7] These fourteen values are listed below, followed by one example of the fuller description he also provided for each value.

1. Truth
2. Goodness
3. Beauty
4. Wholeness
5. Aliveness
6. Uniqueness
7. Perfection
7a. Necessity
8. Completion
9. Justice
10. Simplicity
11. Richness
12. Effortlessness
13. Playfulness
14. Self-sufficiency[8]

> 4. Wholeness: (Unity; integration; tendency to oneness; interconnectedness; simplicity; organization, structure; order; not dissociated; synergy; homonomous and integrative tendencies).

Maslow held that these Being-values are the characteristics and preferences of fully human people, and therefore the characteristics of ideal art, of ideal science, and of the ideally good society. He even suggested operations which could define the meanings of each of these Being-values in testable form.

This is a remarkably comprehensive undertaking. What Maslow has endeavored to do is categorize those elements which go to make up transcendental perception and thereby discriminate the context of holistic vision. In other words, he has tried to discriminate the contents of the tacit dimension from which TD principles spring. It may therefore be valuable to use these characteristics, which define the perception of self-actualized people, as working hypotheses for transdisciplinarity, i.e., as candidates for TD principles.

A set of TD principles generated from this level of insight could satisfy both elements of the definition of transdisciplinarity. First, they could be applied to, and hence interconnect, all fields of knowledge. Second, they could serve to link the disciplines in a common purpose. What is this element of common purpose, or what Maslow called the "hint of value," associated with TD principles derived from transcendental perception: It is their embodiment of qualities of wholeness which guide the disciplines they illuminate toward growth of wholeness.* The sciences seek comprehensiveness of understanding and humans seek wholeness of life. Thus TD principles reflecting holistic values could subtly suggest the direction toward that far goal. When I use the expression "a comprehensive set of TD principles," it reflects my belief that there are a limited number of basic types or categories of TD principles. The word 'comprehensive' is meant to imply a set of TD principles in which all of these basic categories are well represented. Nothing could be further from my mind than the idea that some set of TD concepts could give us a firm and complete program for grasping the inexhaustibly complex realities of interconnectedness in nature. This would be opposed to the entire spirit of transcendence through which one becomes more fully aware of the many-sidedness of reality and the inability of any symbol system to adequately reflect what it seeks to describe. The number of permutations and combinations of TD principles operating in nature must come close to the proverbial number of atoms in the universe. But just as atoms can be placed into the 109 categories of chemical elements, so too do I believe that a similar structure exists for transdisciplinary principles.

Two final points should be made. Maslow was by no means the first to attempt to study the cognitions of transcendental experience. This has been the major focus of inquiry in the

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*If we conceive of the various disciplines as Phenix does: "as channels of insight into the structure of being,"[3] then it would be expected that many TD principles reflecting Being-values would find their counterparts, expressed in principles of the disciplines, especially the more advanced disciplines. This suggests that such a synthesis may not have been possible a hundred years ago simply because the disciplines were not adequately advanced.

East for thousands of years. The ancient Vedic texts of India present a comprehensive system of knowledge based entirely on the transcendental cognitions of Vedic seers. Just because these formulations predate the advent of Hinduism by thousands of years, there is no reason to assume that they cannot be used to inform a transdisciplinary perspective in a modern secular university.*

Secondly, from the perspective of the Vedic East, it is not the study of, but the experience of transcendence which is most important. No intellectual system is, in itself, seen to provide an adequate basis for the unification of knowledge and life. "Darkness is not dispelled by mention of the word lamp." (Katha Upanishad)

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*See the February, 1980 issue of the AIS Newsletter for a description of the Maharishi International University curriculum in which the ancient Vedic texts and modern scientific traditions have been fused to create a transdisciplinary perspective.

FOOTNOTES

[1] Erich Jantsch; *Interdisciplinarity: Problems of Teaching and Research in Universities;* Center for Research and Innovation; 1972; pg. 106.

[2] Bertrand Russell; Quoted in *The Learning Society;* 1968; pg. 120.

[3] Michael Polanyi; *The Tacit Dimension;* 1967; pg. 19.

[4] Abraham Maslow; *Religion, Values and Peak Experiences;* 967; pg. 61.

[5] Guy Michaud; *Interdisciplinarity: Problems of Teaching and Research in Universities;* Center for Research and Innovation; 1972; pg. 286.

[6] Abraham Maslow; *The Farther Reaches of Human Nature;* 1971; pg. 133.

[7] *Opt. cit* #6, pg. 133

[8] Philip Phenix; "Transcendence and the Curriculum," *Teacher's College Record;* Dec. 1971; g. 281.

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CAN PROGRESS TOWARD INTERDISCIPLINARY EDUCATION BE BUILT ON A DISCIPLINARY BASE?

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For interdisciplinary educators, such as the members of the Association for Integrative Studies, two observable trends in American higher education are depressing. We are laboring in institutions which appear increasingly to value vocationalism, specialization, and compartmentalization with many faculty members identifying more readily with national professional groups than with local academic communities. And, correspondingly, the number of islands of innovative interdisciplinary educational experimentation and development is diminishing. Financial constraints, political conservatism, and student vocational orientation all are instrumental in this retreat from integrative education.

This essay is a response to these trends and is an attempt to promote consideration of integrative options for educational institutions which are unable to sustain or create unified interdisciplinary programs such as Evergreen or Western College of Miami (Ohio) University or Wisconsin-Green Bay or our own recently deceased Centennial Educational Program at the University of Nebraska-Lincoln. The demise of the latter, with which I had had several years association, and the knowledge that its death is not a unique event, causes me to offer these reflections on ways in which "integration" may be created or nurtured even in a rather traditional "disciplinary" environment. These ideas and experiences are offered as stimuli to discussion rather than reports on completed research.

At root, each of the integrative possibilities suggested in these paragraphs is based on a set of premises which appear to be commonly held by most members of the Association for Integrative Studies. Most of our work assumes that interdisciplinary education presents more realistic analytic opportunities than does narrowly specialized study; that it allows consideration of vital societal concerns in a fashion which has the potential to lead to serviceable conclusions and recommendations; and that it tends to break down the authoritarian nature of an educational process in which students in a discipline-oriented curriculum are confronted with a single "expert" or "expert opinion" about a particular topic of investigation. Interdisciplinarians value the multifaceted reality, complexity, ambiguity, and adaptability which most interdisciplinary, integrative education represents and models.

Here are offered some reflections on interdisciplinary educational opportunities which have worked or may work within the confines of a traditional discipline-oriented college or university.

I. Organization of courses or faculty around a thematic focal point.

Perhaps the clearest model of this approach is the Federated Learning Community described in some detail by Professor Eli Seifman of SUNY-Stony Brook at the 1979 AIS meetings. The Federated Learning Community is able to create interdisciplinarity by grouping existing courses around a common theme relevant to each of the courses. A group of students is then able to consider integrative elements in the FLC courses via a common seminar and with the help of faculty who have also had opportunities to evaluate the relationships between their courses. Past FLC themes at Stony Brook have included "Society, Values, and Technology," "World Hunger," and "Cities, Utopias and Environments."

And fortuitously, just as experimental integrative "colleges" are fading, thematic programs seem to be on the ascendancy in higher education. As one example, Centers for the Study of the American Business System are sprouting everywhere. And, while their primary reason for existence is to funnel corporate funds into universities which then will say nice things about corporations, such Centers may provide handy vehicles for faculty or course groupings. Why not a CSABS-funded semester of courses integrated around the theme of "The Ideological Base of the American Economic System" or "The American Business System and Third World Economic Development"? Such a program of study could draw upon courses from departments of history, political science, economics, and, perhaps, philosophy, or literature, or area studies programs.

Any other existing thematic program seems suitable as a host for creative interdisciplinarity. At the University of Nebraska, an expanding Center for Great Plains Studies is one possibility. Similar programs might surely be found to serve a similar function at most institutions.

And, on a still smaller scale, thematic integration can be created out of thin air. One such example, of some success, is an introductory course in Slavic Studies created by the faculty members of the University of Nebraska-Lincoln Slavic Studies committee (representing History, Political Science, Economics, Geography, Modern Language) who team-teach this integrative course on an overload basis.

Or, perhaps a campus can host a community-wide seminar on a theme of current interest. Recently, again at UN-L, the community seminar was "American Survival," co-led by a philosopher, an anthropologist, and a professor of English. It had, as students, other university faculty members, undergraduates, gifted high school seniors, public school teachers, and interested citizens. It helps to have an "umbrella" course designation, and a few dollars as stipend to organizing faculty members.

II. Integrative education via a pedagogical or epistemological focus.

An alternative way of looking at integrated rather than fragmented education is to concentrate on integrative teaching styles or educational goals, rather than subject matter. One such approach is the ADAPT program at UN-L. (ADAPT is an acronym for Accent on Development of Abstract Processes of Thought.) The integrative force in ADAPT is a shared faculty commitment to the goal of student cognitive development along dimensions suggested by Jean Piaget and a "constructivist" epistemology. Overly simplified, these faculty operate on the hypothesis that students "construct" knowledge through interaction with a stimulating environment, rather than "absorb" or "catch" or memorize understanding. In such a program a developmental goal can be simultaneously pursued in all classes, even though the subject matter and the disciplines involved are very diverse. Student and faculty concentration on thought processes, problem solving, and experiential education are another way to achieve an integrated, integrative education within traditional disciplinary structures and forms. In fact, it might well be argued that only if a faculty shares a common view of learning can coherence be achieved in an educational program. The integrative element may be an epistemological viewpoint rather than a common topic.

Of course, the shared educational philosophies or pedagogical strategies from which one might choose are varied. An integrative program built on a behaviorist rather than a developmental base can be imagined. Whatever the base, the principle of coordinated faculty consideration of student learning behaviors, and the consistent design of appropriate teaching strategies are integrative processes which reduce educational fragmentation.

III. Integration via Technology.

One area, often cursed by humane educators, which may be surprisingly adaptable for integrative education, is educational technology. Consider computer-assisted instruction, video or audio cassette modules, videodiscs, and other such mechanical adjuncts to classroom instruction. A major obstacle to interdisciplinary education in the traditional classroom is the expense and administrative difficulty of assigning several faculty members, representing several disciplines, to a common study group or class. However, the one-time placement of the contributions of those faculty members on appropriate soft-ware to be used and re-used for integrative purposes seems to alleviate some of those logistical and budgetary problems. For example, while it might be prohibitively difficult to place an economist, a physicist, and a political scientist in a class on energy semester after semester, the development of an educational videodisc with appropriately organized and related inputs from all three might be a significant addition to a class taught by a single instructor from any one of those departments. Technology might, in this way, bring interdisciplinary contributions and challenges into many traditional "disciplinary" classrooms. And, as opposed to a book which might be assigned, the computer or disc might well be "student-interactive" in any of the disciplines used. This techological development of interdisciplinary packages seems to lie on an underexplored educational frontier.

IV. Shared classrooms or "team teaching".

The idea of team teaching or shared classrooms is by no means novel; nor is it feasible economically for an extended period of time on most campuses. What might be suggested here, therefore, is the development and extension of experiences which tend to create an "interdisciplinary instructor" in a disciplinary environment. As a personal example, on three occasions I have been able to share a classroom with a faculty member from another discipline for one or two semesters. These opportunities involved a course on energy shared with a physicist, a course on economic ideas in literary form with a professor of English, and a course on ethical underpinnings of economic systems with a philosopher. In each case, the specific course was short-lived, and was intended to be so. Most of us cannot, semester after semester, share courses while teaching our assigned loads within our home departments. But the essence of those experiences remains in the form of enhanced appreciation of literary expressions of economic ideas, philosophical presumptions underlying economic forms, and physical parameters to economic possbilities. I am an enriched "interdisciplinarian" for these experiences, and if they were replicated across a campus the experience of students within "traditional" disciplinary courses would be quite untraditional.

Where budgets and course loads allow, such a shared classroom could be part of a faculty member's load for one semester. Where such flexibility is not present, an overload assignment, which would be extraordinarily stimulating, might be the only practical way to accomplish the task. This procedure of "interdisciplinarization" of a traditional faculty member is recommended only for the already-tenured.

V. Faculty Exchange Programs: Intra and Inter-Campus.

An extension and elaboration of the previous "shared classroom" idea is the concept of a semester-long (or year-long) faculty exchange. But contrary to the normal exchange program, the proposed exchange would cross disciplines. Thus an economist might exchange positions not with another economist, but with an historian, philosopher, or political scientist on the home campus or elsewhere. The exchangees would probably not be asked to "teach courses" as such (here again, some administrative and budgetary flexibility is important) but would instead participate in an agreed-upon set of courses from the host department's standard curriculum. Thus, students would receive interdisciplinary education in the shared courses and the involved faculty members would undergo an intellectually broadening experience which would become a permanent part of their mentality. Again, the benefits last long beyond the immediate semester which the department, college or university subsidizes.

VI. Faculty Development and Curricular Modification.

This suggestion, fortunately, is able to reinforce rather than counteract contemporary currents in higher education. Many colleges and universities are realizing the need for renewal of faculty creativity, scholarship, and teaching energy and are expanding faculty development leave or sabbatical possibilities. Additionally, a nationwide curricular reform movement seeking to re-establish the concept of a "core" liberal education curriculum for all students is underway. Each of these trends can be used to foster integrative or interdisciplinary educational change.

For example, in curricular reform processes, one clear goal is the broadening of a student's vision through completion of an array of courses "distributed" appropriately across the curriculum. Cannot the same objective be approached by encouraging enrollment in interdisciplinary courses which provide assistance to the student in developing processes of academic integration? And just as colleges require at least one or two courses in a variety of specified areas, might we not also consider the requirement of one or two interdisciplinary courses as particularly valuable examples for the synthesizing intellect?

Similarly, as our educational orientation becomes more consciously holistic, might not some of those faculty development leaves be earmarked specifically for acquisition of interdisciplinary competence? Obviously, an institutional interest in interdisciplinary courses as part of a core curriculum and interdisciplinary faculty members to teach them go hand-in-hand. The College of Arts and Sciences at the University of Nebraska-Lincoln is currently seeking such interdisciplinary course construction to be added to their newly drafted "liberal education options". Might not other institutions be encouraged to do the same?

VII. Cluster registration of students and parallel concept development.

One last option, related to one or two of the earlier alternatives, suggests itself. Perhaps least "integrative" at the level of faculty development or participation, it at least allows students to integrate analyses and to discuss concepts across disciplines as they are taught the same or similar skills and methods in several disciplines at the same time. Such a process would require some faculty coordination and planning to assure that a given tool or idea (perhaps graphical, or mathematical, or statistical, or sociological, or psychological, etc.) emerges in several courses simultaneously. Students would at least have the benefit of seeing the relevance of a concept in several disciplinary frameworks, and would be able to discuss its multiple applicability with fellow students and with the participating faculty members. Although not "interdisciplinary" in the sense we normally use the term, this process would allow students to peak at the "unity of knowledge" with respect to a group of analytical concepts or tools.

For this suggestion to be implemented, administrative cooperation in facilitating group or cluster registration of students would be needed. That is, a group of students would have to be placed in the same sections of several courses to allow them to participate in the related activities of that set of instructors. Clearly, a side benefit of such clustering, at least at a large college or university, would be that a group of students would know one another in the classroom (would perhaps form a "community") with possibilities for further social and intellectual interaction.

The foregoing, then, are suggestions of a few constructive ways in which the objectives of integrative scholars and educators could be approached. This listing is neither qualitatively nor quantitatively exhaustive. If it serves to generate thought and discussion, fresh and improved ideas should emerge to supercede these. Some of these ideas have been successful in integrating a segment of the education process; others can be as well.

In concluding this commentary, a very few words should be added concerning the "circumstances and requirements", both administrative and budgetary, contributory to the success of some or all of the foregoing suggestions. The following is a list of a few "nuturing elements".

1. Some slight curricular "flexibility" is helpful. This might be as little as a few "special topics" course numbers to be used for interdiciplinary ventures--or as much as an unstructured academic unit to house experimental ventures.

2. Some slight budgetary flexibility also is very significant. At UN-L, a "Teaching Council" with 50,000-100,000 discretionary dollars annually can provide room for faculty and curricular maneuver. And, most Deans have a few discretionary dollars.

3. Some network of contact and communication for faculty members across disciplinary lines is important, particularly at a large institution. On our campus, an informal "Chowder Society", meeting monthly around educational concerns, is one such vehicle. As a result of such regular sessions, groups of like-minded faculty members have coalesced around project ideas; it was here that ADAPT originated, for example.

4. The "excess capacity" in some segments of a college or university resulting from enrollment shifts can be a constructive resource. Reductions in student demand may free faculty time and energy to explore possibilities discussed earlier. Such relative "cushions" within an institution are at least places in which resources can be sought for interdisciplinary creativity.

5. Grant support is, of course, helpful and is not a novel suggestion. Several of the types of activities mentioned earlier have been grant recipients; more can be. Grant proposals tying interdisciplinarity to technological innovation might be particularly fertile. Don't overlook outside funding possibilities.

6. A dedicated faculty is, perhaps, the key ingredient. A supportive, interactive, energetic, creative core group of

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enthusiastic educational innovators can bring results out of the paltriest resource base. If such a core exists on a campus, it should be activated. If it doesn't presently exist, it can be formed.

While the future of large-scale, free-standing interdisciplinary programs may be uncertain and contrary to prevailing winds in higher education, small havens of creative possibility can be found to nurture those who share integrative ideas. Institutions, no matter how tradition-bound and forbidding, often reveal themselves to be vulnerable to creative individuals with energy and wit to chip away at cracks and crevices. Perhaps these notes indicate a few points of attack.

# # # # #

ISSUES IN INTEGRATIVE STUDIES

An Occasional Publication
of the
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Issues in Integrative Studies seeks papers on the following topics:

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ISSUES IN INTEGRATIVE STUDIES

An Occasional Publication of the

association for integrative studies

1983

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The Association for Integrative Studies was founded in 1979 to promote the interchange of ideas among scholars and administrators in all of the arts and sciences on both intellectual and organizational issues related to furthering integrative studies. It is incorporated as a non-profit educational association in the state of Ohio and recognized as such by the IRS. The purposes of the Association are:

1. To articulate the nature of integrative studies and to document their importance for higher education and for society.
2. To establish standards of excellence for the conduct of integrative studies in both research and teaching.
3. To maintain a communication network for the exchange of scholarly and pedagogical information on integrative studies among faculty and administrators in higher education.
4. To enhance research and teaching in integrative studies by promoting the development of interdisciplinary theory, methodology and curriculum design.
5. To serve as an organized voice and as a national source of information on integrative and interdisciplinary approaches to the study of human experience.

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Individuals and institutions who support these purposes are encouraged to join the Association. Annual dues are $30.00 for institutions, $20.00 for individual professionals and $10.00 for students. The Association publishes a *Newsletter* as well as the *Issues* for its members and holds an annual conference. Applications for membership and dues payment should be sent to:

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ISSUES IN INTEGRATIVE STUDIES

No. 2 • 1983

The Case For and Against Interdisciplinary Studies

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ISSUES IN INTEGRATIVE STUDIES

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THE CASE FOR AND AGAINST INTERDISCIPLINARY STUDIES

Editor's Note

In the 1982 number of *ISSUES IN INTEGRATIVE STUDIES*, there was an article by Professor Thomas Benson ("Five Arguments Against Interdisciplinary Studies") in which he contended that interdisciplinarians need to pay more attention to the arguments against their work, and then proceeded in a self-described "bit of enlightened devil's advocacy" to discuss five of these arguments. The organizers of the Association's annual conference at Ramapo College in New Jersey (April 14-16, 1983) thought that Benson's provocative efforts should not go unanswered; so the conference opened Thursday evening with a panel chaired by President Tom Murray which was devoted to solicited responses from three active members of the Association, Professor Bill Newell of Miami University of Ohio, Professor Jerry Petr of the University of Nebraska at Lincoln, and Professor Ray Miller of San Francisco State University. Professor Benson was there to summarize his article and to respond after the presentations.

This note will summarize Benson's five arguments. The responses in the order of their delivery will follow, and then Professor Benson will again have the opportunity to respond. In Professor Benson's experience five major arguments are repeatedly made by those not enamored with interdisciplinary studies. The first is that "...it rests upon serious conceptual confusion." The disciplines have gotten their acts reasonably together with distinctive subject matters and modes of inquiry, while the principles of connection and method for integrative studies are not only unclear but seldom articulated. The second argument holds "...that it is a pedagogically doubtful business to spend time in interdisciplinary learning projects when the student lacks a mature base in any of the contributing disciplines." This is not only a question of scarce time allocation within the undergraduate four year curriculum, but also a question of which educational experiences provide the most effective analytical tools and substantive knowledge. Thus the third argument: "...a substantial commitment to integrative studies in the undergraduate program will impede the student's development of an essential disciplinary competence." Presumably, it is disciplinary competence which enables students to acquire admission to graduate school or achieve access to the best job opportunities. For it is widely believed (the fourth argument) "...that integrative studies courses are characteristically shallow, trading intellectual rigor for topical excitement." Interdisciplinary courses sometimes take the form of a "semester long variety show." And in addition (the fifth argument) they have a "relatively high cost: because of team-teaching arrangements, low student-faculty ratios, etc. Benson ends his discussion with a recognition of other arguments, a call for more information and careful thought and a challenge to all concerned interdisciplinarians--taking up the task of responding "both intellectually and politically" to the arguments against interdisciplinary studies.

The remaining papers in this *ISSUES* by Klein, Blum and Betts are also based on presentations made at the Ramapo Conference (April, 1983) of the Association.

THE CASE FOR INTERDISCIPLINARY STUDIES: RESPONSE TO PROFESSOR BENSON'S FIVE ARGUMENTS

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The objective of this paper is to respond serially to Professor Benson's five arguments by setting forth a conception of interdisciplinary study, not necessarily as it is practiced but as it should be, which largely meets his criticisms.[1] The final section of the paper offers suggestions for steps that the interdisciplinary studies profession should take to respond fully and effectively to its critics.

A. Responses to the five arguments

1. Interdisciplinary studies rest on serious conceptual confusion.

While single interdisciplinary courses may have a clear sense of purpose and method, it is undeniable that the practitioners of interdisciplinary or integrative studies share no such clear sense. This is apparent in the very analysis used by Professor Benson. While he assumes that interdisciplinary studies are concerned with "connections ...between disciplines,"[2] he recognizes that some interdisciplinarians are more concerned with connections in the real world ("the natural connectedness of things"[3]), others with connections in ("the unity of") our knowledge of that real world, while still others emphasize the "practical value of interdisciplinary projects in the solving of specific problems"[4] where it is unclear that any of the above connections are of direct concern. In my view this last problem-solving conception of interdisciplinary studies is the most fruitful. It has the greatest capability of meeting the five arguments against interdisciplinary studies, and the connections that it requires are different from any of the above.

Interdisciplinary study should be understood to start with the confrontation of the interdisciplinarian with the world, be it a problem, an event, or even a painting. Out of that phenomenological confrontation comes a question, one which is too broad to be answered by any single discipline. The strategy of the interdisciplinarian is to bring the relevant disciplines (or schools of thought) to bear upon the question, one at a time, letting each illuminate that aspect of the question which is amenable to treatment by the characteristic concepts, theories, and methods of the respective disciplines. Out of the resulting disciplinary insights, the interdisciplinarian fashions a response to the question that would ideally be a complete answer but which at the least leads to a greater appreciation of the nature and complexity of the question. What distinguishes interdisciplinary study from simple eclecticism is that disciplines provide much more than pieces of a jigsaw puzzle that the interdisciplinarian need merely arrange in proper order. Disciplinary insights are often conflicting, and when the disciplines are chosen from more than one area, such as the natural sciences and the humanities, their insights are typically of a qualitatively different nature as well. As Professor Miller stresses,[5] disciplines each have their distinctive world view or way of looking at the world, and it is these world views with their often contradictory underlying assumptions and diverse value judgments that lead to conflicting or incommensurate insights. The interdisciplinarian, then, may not simply combine disciplinary insights; rather, each world view and its assumptions underlying those insights must be illuminated and then evaluated in the context of the question at hand, before any interdisciplinary answer can be attempted. Out of this process comes a richness of insight not available to the adherent of any one disciplinary orthodoxy, as the interdisciplinarian comes to appreciate the value and legitimacy of alternative perspectives.

Professor Benson asks that we construct a "coherent, defensible sense of (our) purposes," that we be clear on "what it means to connect the disciplines" and on "what the value of such activity might be,"[6] and that we refrain from excusing our lack of clarity on the purported vagueness of the disciplines themselves. He is correct in his contention that none of the notions of "connecting disciplines" which he presents meets these requirements, but I submit that the conception set out above does meet them. The disciplines can give only partial answers to questions that go beyond their bounds, and when seen from the perspective of certain other disciplines their answers seem flawed as well as incomplete.

The purpose of interdisciplinary study is to address questions that transcend disciplinary boundaries. Only the interdisciplinarian, who is familiar with and receptive to those contrasting world views, can deal adequately with such questions. Further, interdisciplinary study does not directly involve the connection of disciplines, which would constitute a colossal intellectual task and a politically hopeless one in times of turf protection. Instead the interdisciplinarian connects disciplinary insights. This task is formidable but limited to the one question at hand, and it admits of the possibility for specialization, so that, for example, an interdisciplinarian might specialize in questions related to the modernization process. Professor Weaver has argued quite convincingly, I believe, that interdisciplinarians can only achieve intellectual respectability when they specialize.[7] Further, the value of interdisciplinary study lies in the fact that many important questions transcend the disciplines.[8] Finally, this conception of interdisciplinary studies in no way depends on well-defined boundaries between disciplines, only on clarity in their insights and in the world view underlying those insights.

Professor Benson goes on to criticize interdisciplinary studies which are nothing more than "a matter of borrowing insights or methods from one or more disciplines to illuminate problems in another." He also insists that we "should be prepared to articulate more fully the principle or principles that determine when these connections are to be sought." He asks, "What principles guide the integrative studies practitioner in choosing to make these connections rather than those?"[9] Finally, he requests that we define our methods more clearly. The conception of interdisciplinary study presented in this paper involves questions transcending any one discipline, thus avoiding the first criticism. The second one is not so easily addressed. Certainly it can be argued that the interdisciplinarian chooses disciplines that purport to address at least some aspect of the question, and the interdisciplinary specialist may only ask questions which require a certain set of disciplines for an answer. But it is not so clear what principles guide the interdisciplinarian in constructing a coherent response to the question out of mutually incoherent disciplinary insights. How does the interdisciplinarian, for example, connect the ethical insights of the philosopher, the technical insights of the natural scientists and the behavioral insights of the economist and political scientist into a coherent proposal for U.S. energy policy? Developing sensitivity to the world views and underlying assumptions of each discipline points out the direction, at least, which the interdisciplinarian must take to look for connections, but we are still far from meeting the last requirement that we spell out our method with some precision.

2. Interdisciplinary study requires a mature base in the disciplines.

Professor Benson presents the argument that until a student has a "firm hold" on "at least one of the contributing disciplines," that student can be "little more than a spectator" in interdisciplinary studies because of the "voluminous literature and often highly technical research traditions" of the disciplines. He goes on to note that if students are assumed to have little disciplinary sophistication, the course will be "almost totally void of a critical base."[10]

The appropriate relationship between the disciplines and interdisciplinary study is a divisive issue among interdisciplinarians too. Even those who accept the notion of interdisciplinary study presented in this paper might well argue that it takes time to learn the world view and assumptions of various disciplines, to say nothing of their characteristic concepts, theories, and methods. If interdisciplinary study builds on all these, then perhaps graduate school is the earliest we can expect students to be prepared to undertake serious interdisciplinary study.

I believe, however, that there is an essential complementarity between the disciplines and interdisciplinary study that makes it desirable for students to learn them together, from first semester freshman year on if not in high school. An academic discipline is a challenging intellectual game at best, and a sterile and meaningless exercise at worst, when it is taken out of the context of human experience, which is always too broad and complex to be captured fully by any one discipline. The disciplines need interdisciplinary studies to come alive to the students, to connect meaningfully to their lives, fully as much as interdisciplinary study needs the disciplines. Moreover, when students are thoroughly grounded in a discipline before becoming exposed to interdisciplinary studies, they tend to become indoctrinated into its world view, uncritically accepting its often implicit assumptions.[11] This indoctrination makes even more difficult the task of developing in students the openness to alternative ways of looking at the world which lies at the heart of the interdisciplinary method.

Interdisciplinary studies should, and can, be taught alongside the disciplines. A typical freshman takes four or five courses at a time, each in a different discipline. An early and continuing task in each of these introductory courses is to get the student to think like an economist, a physicist, or whatever, to imbue her or him with the world view of that discipline. Moreover, students are usually given problem sets or writing assignments in each course, in which they are asked to apply what they are learning. No one expects the freshman to to bring the sophistication of the graduate student to these tasks, to address the assignments in their full complexity, or to select from the full range of concepts and theories in the technical literature of the disciplines. Why should we think any differently about the freshman student undertaking an interdisciplinary analysis?

A freshman could reasonably take a load of three or four disciplinary courses and an interdisciplinary one that builds on those disciplines. As the student learns the world views of each discipline, she or he can learn to contrast them and scrutinize their assumptions in the interdisciplinary course. The assignments in the interdisciplinary course can start out as simple as those in the disciplinary course, leading the student to draw rudimentary connections between the insights of those disciplines. In fact, the problem can be chosen so that the student need draw only on those disciplinary insights taught so far in the disciplinary courses. Were we to construct such a freshman year, our students would not only learn solid disciplinary material, but they would also learn an interdisciplinary appreciation for those disciplines as limited but useful tools in their own lives.

When the curricular relationship between the disciplines and interdisciplinary studies is viewed in this light, it becomes possible to appreciate the educational merit of a well-conceived interdisciplinary program for freshmen. Instead of the administratively cumbersome freshman year sketched out above, why not set up a program where students are taught the relevant disciplinary materials in the same course where they learn to think about problems from an interdisciplinary perspective? Interdisciplinarians can select and teach the relevant disciplinary materials in the context of analyzing an interdisciplinary question. Disciplinary world views can be contrasted as they are learned and their strengths and limitations revealed as they are applied to an interdisciplinary question that grows out of the experience of the students. For example, I teach a first semester freshman social science course that examines what kind of control the students have over their own lives. They learn a portion of each social science discipline dealing with individual freedom, which means they learn everything from the theory of consumer behavior in economics, to operant conditioning in psychology, to the socialization process in sociology. The theories are treated in their full academic rigor, right down to problem sets with graphs; and their underlying assumptions are examined and explicitly compared. In the concluding section of the course entitled "Freedom within Social Controls," we pull together these disciplinary insights into a discussion of how much freedom students have and how that freedom can be expanded. Students come away from the course with a critical appreciation of a representative portion or two of each discipline, an appreciation for its analytical power and for its limited but genuine applicability to the world of their experience, and the beginnings of an awareness of the interdisciplinary process. Over a series of such courses, students become familiar with a considerable body of disciplinary material as they develop increasing sophistication in the interdisciplinary method.

While I believe that students can and should learn interdisciplinary studies alongside the disciplines, the difficulty of teaching the interdisciplinary approach should not be underestimated. The kinds of thinking involved in interdisciplinary study are more difficult and require more intellectual maturity than do the disciplines. Scholars studying the process of intellectual development of college students, from Bloom to Piaget to Perry to Kohlberg,[12] have argued that there is a hierarchy of intellectual skills or a series of stages of intellectual development through which students must pass on their way to full intellectual maturity. The integrative thinking required in interdisciplinary study which involves pulling together and synthesizing disparate disciplinary insights into a coherent whole is at the top of the hierarchy. The ability to embrace tentatively the use of one disciplinary world view and then switch to using another, possibly opposing, world view, and take that equally seriously requires some of the most advanced stages of intellectual development. Most freshmen I have taught find these skills difficult to develop, and a few never do; but the majority have risen to the occasion. In spite of the intellectual challenge of interdisciplinary studies, I conclude that they can and should be taught in conjunction with the disciplines instead of waiting for students to develop disciplinary competence first.

3. Interdisciplinary study impedes essential disciplinary competence.

The substance of Professor Benson's third argument is that time is scarce in the undergraduate curriculum, time that is required to provide adequate training in the more important disciplines rather than in possibly desirable but clearly less important interdisciplinary study. Disciplines are not only more rigorous and their study an orderly progression into more sophisticated thinking, but they are also practical preparation for graduate schools and competitive careers that expect and require disciplinary training. Time spent outside a disciplinary major in general education, so the argument goes, is best spent in disciplinary introductory courses because they are "rigorous" and "challenging" (not "fragmentary" like interdisciplinary courses) introductions to the "concepts, methods, and traditions" which form the foundations of the disciplines.[13]

The first part of this argument strikes me as having the most force. Certainly some students should major in disciplines, specializing in one intellectual tradition in preparation for a career as a specialist. After all, division of labor based on specialization is essential to an industrialized society. But many, if not a majority, of the jobs in our society bear scant correspondence to any one liberal arts discipline: retail salesmen and administrators are more common than industrial chemists. For such positions, the abilities to understand and critically evaluate the work of experts and to make decisions based on that evaluation seem more important than a specialized knowledge of any one discipline. Furthermore, increasing numbers of careers require specialized backgrounds that are interdisciplinary. Dealing with environmental problems, urban problems, energy problems, and many others requires training in synthetic thinking, in weighing arguments from diverse narrow disciplinary perspectives, and in placing them in the larger context. The narrow vision and piecemeal approaches of disciplinary specialists have only exacerbated these problems.

While the expectations of employers are that college graduates applying for jobs will have a disciplinary major, most employers have no particular loyalty to the academic disciplines, especially when they are hiring for jobs that do not build directly on disciplinary competence. Employers are particularly attracted to interdisciplinary majors because of the abilities of the students "to think conceptually, to identify and solve problems, to understand other value systems, to evaluate alternatives and decide on a course of action, and to change one's opinion in the light of facts."[14] Employers also cite traditional liberal arts skills of effective written and oral communication when they explain why they hired graduates of interdisciplinary programs, as well as affective skills like effective group participation, ethical sensitivity, and constructive response to criticism which reflect the experimental college setting of many interdisciplinary programs. According to available data, placement rates of graduates from interdisciplinary programs are quite high.[15]

The charge that the disciplines are more rigorous and ordered than interdisciplinary studies has some limited validity as well. Because the disciplines have been around longer than formal interdisciplinary study, they have evolved further, become more codified and articulated, and have developed more systematic methods. But if one accepts the conception of interdisciplinary study as based on the disciplines, then serious interdisciplinary studying involves these disciplines in their full intellectual rigor. In addition, it is not at all clear that interdisciplinary study is inherently less rigorous than a discipline at the same point in its evolution. After all, rather rigorous and technical fields like biochemistry can be argued to have grown out of interdisciplinary efforts. Few scholars today would wish to claim that oceanography, for example is non-rigorous. Surely the intellectual skill of synthesis is as challenging as any required by the disciplines. There is an element of art in the interdisciplinary process of synthesis or integration which may never prove amenable to systemization, but many disciplines in the humanities contain similar room for creativity in their method without charges of nonrigor, and there is no basis in principle why interdisciplinary study should face that charge as well.

The argument for a general education composed of introductory disciplinary courses is curious indeed. What can be more fragmented than a series of disciplinary courses that are completely insulated from one another? What can be less fragmented than a well-constructed interdisciplinary course? Nor is it clear that rigor in general education is best served by more of the same disciplinary training. After all, the real claim to rigor by the disciplines is based on their highly developed literatures and technical methods which are inaccessible to students in the introductory course. It may be that the charge here is fundamentally one of poor quality, not fragmentation or lack of rigor. In part, however, I suspect the basis for the charge lies in the implicit premise that the disciplines are sufficient as well as necessary to the world of the intellect, and consequently that introductory courses should have as their primary goal the introduction of a discipline, and only secondarily the introduction of knowledge or intellectual skills. This logic clearly relegates interdisciplinary study to secondary importance at best, but it also begs the question.

On the other hand, if one believes that most use of the disciplines by nonspecialists requires the judicious weighing of the contributions of several disciplines to the analysis of a problem and the eventual formulation of a means of dealing with the problem that goes beyond any of the disciplines while being informed by them, then interdisciplinary study forms a necessary component of general education alongside the disciplines. Certainly the trend in higher education over the last few years has been to increase substantially the role of interdisciplinary study in general education. Klein and Gaff found that 69% of the colleges they surveyed include an interdisciplinary component in their new general education programs; 55% require a core of interdisciplinary courses.[16] The motivation for including interdisciplinary study in general education appears similar, at least, to the argument presented here: 53% cite the ability to synthesize as a major objective of their new general education programs.[17]

4. Interdisciplinary courses are shallow.

Professor Benson's fourth argument against including interdisciplinary courses in an undergraduate liberal arts education is that they trade "intellectual rigor for topical excitement."[18] Three criticisms are leveled under this heading. First, too many interdisciplinary courses are big-picture counterparts of the trendy, relevant and superficial treatments of important issues by the mass media: "There are simply too many interdisciplinary faculty driving curricular ice cream trucks down the academic alleys."[19] Second, such courses are "taught in a sloppy, chat-in-the-round fasion that does little to cultivate either critical skills or a systematic grasp of the issues.... compounded by a heavy reliance on splashy special events..." such as films and guest speakers.[20] Third, too often "the anticipated synthesis fails to materialize," leaving students as guinea pigs for irresponsible faculty who have not thought out the course with sufficient care.[21] Each of these charges is serious, in my opinion, because each contains a substantial element of truth, and my discussion of each is aimed at understanding why, inasmuch as it is defending interdisciplinary studies.

One can reasonably point out, in response to the first point, that interdisciplinary study is ideally suited to address the relevant issues of the day crying out for analysis, that there is educational merit in enhancing student motivation to learn through the use of interesting examples, and that disciplinary criticism comes from sour grapes tasted by faculty whose fields have less innate interest and less direct applicability to the world we all live in than does interdisciplinary study. Nonetheless, I saw many so-called interdisciplinary courses taught in the late 60s and early 70s that were little more than academic froth, and I still run into such courses today on occasion. These courses lack substance, in my opinion, because they ignore the disciplines, preaching instead an ideology or simplistic solution--say the 'soft-path' approach to energy--which draws selectively upon disciplinary findings without giving students any feel for how each discipline arrives at those findings or how each has a different perspective on the issue that might contribute to a richer analysis. I call this approach 'adisciplinary' because it tries to operate in an intellectual vacuum, drawing facts from the disciplines while pretending that their extensive intellectual traditions and well-developed perspectives are nonexistent or worthless.[22] In some cases this approach stems from the faculty member's adherence to any of several partisan ideologies, but in others it simply reflects a lack of clear notion of the nature of interdisciplinary study.

It is not surprising that faculty who are curricularly innovative will be pedagogically innovative as well. Indeed it must take a moss-backed traditionalist to argue that films and guest lectures lead to lack of rigor. But too often self-styled interdisciplinary courses are little more than a sequence of "splashy special events" which replace critical student thinking more than they excite it. Too often discussion groups in interdisciplinary courses slide from recognizing the limited validity of alternative disciplinary perspectives into accepting each participant's perspective as equally valid, without examining either the limitations or interrelationships of those perspectives, and certainly without attempting to synthesize them into a more comprehensive approach to the issue under discussion.

One consequence of innovation is that well-established norms are left behind. Faculty attempting to put together and teach interdisciplinary courses can draw upon no clear curricular and pedagogical guidelines, any more than interdisciplinary researchers can be guided by the canons of interdisciplinary scholarship. Until the interdisciplinary studies profession reaches some agreement on what it means to put together and teach an interdisciplinary course, and do it well, we will continue to find nonrigorous and uncritical interdisciplinary courses designed in good faith by faculty in pursuit of the elusive goal of interdisciplinarity.

The third point especially hits home to me, since most interdisciplinary courses I have taught failed to result in a clear-cut synthesis. My observation is that most other interdisciplinary faculty encounter similar difficulties even though there is widespread agreement that a synthesis at the end of the course is desirable. In some cases, synthesis is attempted by assigning a paper at the end of the course in which the student is asked to integrate the course material into a coherent position or policy or personal statement. I have used this device myself on several occasions. When a paper assignment replaces an integrative unit in the course, however, faculty are simply asking the students to do what they themselves cannot or will not. Synthesis is a skill that requires training and practice and feedback like any other skill: assigning the task of synthesis and grading the result does little to foster the development of this skill. Especially with a higher order skill like synthesis, students need exposure to several alternative attempts at synthesis which are analyzed and critically evaluated before attempting their own. They need guidelines, or helpful hints at least, to get them started, and they need standards by which to judge their own progress. Unfortunately guidelines and standards are hard to come by in our profession. The process of integration or synthesis is poorly understood and little studied by professional interdisciplinarians. It is no wonder that we achieve synthesis so seldom in our courses.

There is a sense, however, in which it is unnecessary as well as unreasonable to expect that each interdisciplinary course should end with a synthesis. Perhaps interdisciplinary courses, like disciplinary ones, should not be expected to present definitive answers to the important questions they raise. Perhaps synthesis should be an ideal, not a goal. It seems more realistic to ask that interdisciplinary study illuminate the question, pointing up the limitations and strengths of competing disciplinary approaches, exploring the full scope and implications of the question, clarifying the nature of the question, and devising standards which an answer must meet, rather than insisting that the question be answered. After all, the pedagogical value comes from getting the students to see the richness of the question and what would be involved in answering it, more than from learning the answer itself.

5. Interdisciplinary courses are relatively expensive.

The final argument that Professor Benson raises against interdisciplinary studies is that their heavy reliance on "team-teaching methods, special events, independent study, and relatively low student-faculty ratios" makes them too "cost-ineffective," at least during the era of fiscal austerity faced by higher education during the next decade. In addition, he points out, many interdisciplinary programs compound this waste by "borrowing adjunct faculty from the disciplinary departments, creating thereby a need for part-time replacements, or by hiring their own psychologist...etc., and thus duplicating...the faculty resources already available in the departments."[23] Even if one grants the validity of the responses in this paper to the other four criticisms of interdisciplinary studies, one might still oppose them on the basis of this argument alone--such is the power of economic arguments today in educational decision-making.

Two of the four examples on which this argument is based are simply inappropriate. Special events and independent study can enrich any course, interdisciplinary or disciplinary, but they play no inherent part in interdisciplinary study as it is conceived in this paper. Innovative faculty can be expected to include them in their courses, and if such innovators are found in disproportionately large numbers in interdisciplinary programs, then it is easy to see why faculty unacquainted with the nature of interdisciplinary study might leap to the conclusion that such features are necessary to it.

The example of low student-faculty ratios is equally inappropriate, but for different reasons. High student-faculty ratios are achieved largely through lectures, which have come to gain acceptance in most disciplines, but which seem to me to serve the same limited functions in the disciplines as in interdisciplinary study, namely to summarize large bodies of literature by placing the issue in its intellectual context, to impart facts, or to explain a technical process. While such background information is necessary to any intellectual process, the heart of that process begins later as we critically evaluate, proffer alternative hypotheses or interpretations, and move towards an appreciation of the issue and towards our own position. This process can be done on one's own, with sufficient feedback from the instructor, or it can be done rather more expeditiously in a well-conducted seminar or discussion section where the group as a whole explores the issue and feedback is more frequent; but it cannot be done in a lecture, where the student is passive recipient not active learner. It is unclear to me that disciplinary inquiry needs active student participation and interaction any less than does interdisciplinary study, or that discussion groups need be smaller in interdisciplinary courses. The problem of student-faculty ratios is not that interdisciplinary courses require lower ones, but that the disciplines have come--perhaps through previous encounters with financial exigency--to accept uncritically a predominantly lecture format for their lower division high-enrollment courses. Because the interdisciplinary programs are the "new kids on the block," and their faculty more idealistic perhaps, they may understandably insist on lower student-faculty ratios; but as they and their faculty grow more worldly in the face of economic pressures, there is no reason inherent in the nature of the interdisciplinary process why they cannot come to tolerate ratios fully as high as those of disciplinary departments.

The example of team-teaching, on the other hand, points up a serious economic problem facing interdisciplinary studies. Team-teaching, meaning two or more faculty in the same classroom at once and hence greater expense, has become a common feature of interdisciplinary programs because it is the simplest way to ensure that different disciplinary perspectives are accurately and convincingly presented to the students, and that any synthesis take full account of each discipline involved. Advocates of team-teaching for interdisciplinary courses argue that a faculty member alone in the classroom is likely to present the strongest case for the discipline of her or his graduate training because it is most familiar, and more likely to accept its implicit presumptions uncritically. Since most faculty in interdisciplinary programs do not have interdisciplinary graduate degrees (and those that do seldom have the kind of grounding in several disciplines needed for interdisciplinary study as conceived in this paper), this argument appears to have considerable force.

Where interdisciplinary courses can attract sufficient enrollment to justify multiple sections, however, team-teaching can profitably be replaced by team-curriculum development. In the Western College Program at Miami University, for example, we rely on team-curriculum development in all our lower division core courses: faculty teach separate sections of a multisection course but they plan the course together and, most importantly, they cover the same material in their respective sections and evaluate their students with the same examinations and paper topics.[24] In my experience, this approach has educational as well as economic advantages over team-teaching. Because faculty must confront the students alone when they lead discussions that prepare students for common course examinations, the faculty are motivated to take seriously the disciplines outside their expertise and to learn them carefully. Faculty colleagues become important educational resources, and weekly staff meetings of the course become cooperative learning experiences as well as an opportunity to debate conflicting disciplinary perspectives. While this approach loses the spontaneous fireworks in the classroom from untrammeled debate between team-teachers, through which the relative merits of each disciplinary perspective are sorted out in front of the students, I believe it more than compensates by forcing the faculty to appreciate the strengths of opposing perspectives before they come into the classroom. Students become more active in the process of exploring the relative merits and weaknesses of competing disciplinary perspectives when they are not observing faculty argue among themselves, and faculty can better guide them through the process because the faculty have been through it themselves and need not concentrate on defending their discipline. Team-curriculum development is no more expensive than traditional teaching since only one faculty member is in the classroom at a time. Its staff meetings may appear to cost more faculty time, but the difference lies more in the manner of course preparation, where individual contemplation of a text is partly replaced by group discussion.

In courses where multiple sections are simply not feasible, the additional expense of team-teaching is more difficult to get around. Most interdisciplinary programs I have visited hold regular faculty seminars that are designed to break down the disciplinary parochialism of faculty. Sometimes these seminars are tied to courses where faculty teach their own sections as they wish; other times, they are unrelated to any course, moving from topic to topic of mutual interest to the participants. Stockton State College, New Jersey, has developed a peer curriculum review process which provides an alternative other than team-teaching to ensure that individually taught courses are in fact interdisciplinary. Their general education curriculum committees review course proposals and talk with the faculty submitting them while the courses are still in the planning stage. They offer suggestions for readings and topics and for ways to make the course more interdisciplinary, much as faculty do in our program during the early stages of team-teaching curriculum development. The proposals are reviewed again before they can appear in the catalog. These examples point up the feasibility of alternative means to team-teaching for promoting the full interdisciplinarity of courses that wish to be interdisciplinary. In my view they are not as effective as team-teaching, but they are possible compromises. Much more effective is to train faculty in interdisciplinary studies through team-curriculum development or team-teaching, and then wean them to individually taught interdisciplinary courses after they have demonstrated sufficient command of and sensitivity to the other relevant disciplines and sufficient familiarity with the interdisciplinary method. This last approach is effective, as I can testify from personal experience, and while it is expensive at first, it holds the promise of future costs more in line with disciplinary teaching.

The final charge under Professor Benson's fifth argument is that interdisciplinary programs are expensive because they borrow or duplicate faculty in disciplinary departments. The preceding discussion has already shown that many interdisciplinary courses can be staffed at a full cost quite comparable to that of disciplinary ones. In these cases, faculty may be borrowed to expand the disciplinary perspectives available in the interdisciplinary program or to make professional development opportunities available to faculty in disciplinary departments, but the program would be well served politically to compensate departments fully for borrowed faculty in order to make it clear that it is not hiding excessive costs in the process.

The duplication argument, on the other hand, reflects a confusion caused by the lack of Ph.D. programs in interdisciplinary studies. When an interdisciplinary program hires a new faculty member with a Ph.D. in psychology and a specialty in social psychology, the department of psychology sees that person duplicating the social psychologist in their department, while the interdisciplinary program believes it has hired someone with interest in and commitment to interdisciplinary studies who will bring the perspective of psychology to the program. What appears by virtue of formal training to be an overlapping specialty in social psychology is by virtue of interest a non-overlapping specialty in interdisciplinary studies. This confusion would be reduced, but not eliminated, by establishing Ph.D. programs for those wishing formal credentials in interdisciplinary studies. Some disciplinary faculty will still be attracted to interdisciplinary study, however, as part of the process of normal intellectual growth after graduate school. Neither the borrowing nor the apparent duplication of faculty, however, constitutes support for the criticism that interdisciplinary programs are too expensive. Such criticism need only be well-grounded when interdisciplinary programs cannot attract the enrollment to justify multiple section courses and when they are also too young to have trained their faculty on-the-job in interdisciplinary teaching. Even then, the root cause of the expense is the lack of graduate training in interdisciplinary study and not its nature.

B. Where do we go from here?

The model set out above of what interdisciplinary studies should be seems to meet all five criticisms identified by Professor Benson. If our profession were to agree on a conception of interdisciplinary studies similar to it, we would be in a position to argue that, in principle at least, interdisciplinary studies can answer its critics. Until such agreement is reached, however, we are quite vulnerable to attack at the very time in American higher education when weak or ill-defined programs are being cut back or eliminated. The traditional means for reaching such accord is debate at professional conferences and in professional journals. The annual meetings of the Association for Integrative Studies provide such a forum, and with the advent of this publication we now have the other one in embryonic form at least. I hope that this exchange between Professor Benson and myself turns out to be the opening of a debate that will move our profession towards consensus on the nature of interdisciplinary study.

Even if that consensus is achieved, we then face the further challenge of bringing our practice in line with our rhetoric before our courses can meet the arguments against interdisciplinary studies. The preceding analysis of these arguments identifies two major tasks essential to meeting that challenge. We need to set standards of excellence in the conduct of interdisciplinary study, and we need to train faculty who teach interdisciplinary study in its method.

We need to agree, in particular, on what it means to teach interdisciplinary studies well. We need to exchange information on individual interdisciplinary courses from a variety of institutions in order to identify models of the most effective ways of introducing students to the interdisciplinary approach or to essential interdisciplinary skills. We need to examine sequences of interdisciplinary courses at various interdisciplinary programs to explore the most fruitful ways of developing interdisciplinary competence in our students; the sequence for introducing disciplinary concepts, theories, and methods; the timing of the introduction of models for bridging disciplines such as structuralism, general systems, etc. And we need to examine the process of teaching itself, not just of curriculum development. Are there special pedagogical or classroom techniques which are particularly appropriate to teaching interdisciplinary studies?

Finally, we need to train faculty in interdisciplinary study. In part, this means training them in the interdisciplinary method, but probably more importantly it means developing in them an appreciation for the world views of the disciplines in which they have not been trained but which are relevant to the kinds of interdisciplinary problems they address. Of course, that appreciation comes only with command of the concepts and theories of at least one portion of the discipline, making the task of training rather substantial. We need to retrain faculty already teaching in interdisciplinary programs as well as training those about to enter the profession. For the latter, we will eventually require a solid graduate program in generic interdisciplinary studies, or at least core courses of such studies in graduate programs in interdisciplinary topics like urban or women's studies. Retraining of existing faculty, both to sharpen their interdisciplinary competence and to provide them with the formal interdisciplinary credentials most lack, can be accomplished in a variety of ways--faculty seminars on individual campuses leading to summer workshops,[25] national summer institutes, summer courses offered by new interdisciplinary graduate programs, leading perhaps to formal certification. The tasks are formidable, as is that of securing consensus, but I am confident that we will accomplish them, and that we will be able to meet the arguments of our critics, both in principle and in practice. I hope that Professor Benson's article plays a key role towards the achievement of that goal.

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FOOTNOTES

[1] This conception is presented in my article with William Green, "Defining and Teaching Interdisciplinary Studies," *Improving College and University Teaching* 30:1 (Winter 1982), pp. 23-30.

[2] Thomas C. Benson, "Five Arguuments Against Interdisciplinary Studies," *Issues in Integrative Studies* 1 (1982), pp. 39.

[3] Benson, p. 40

[4] Benson, p. 41.

[5] Raymond C. Miller, "Varieties of Interdisciplinary Approaches in the Social Sciences," *Issues in Integrative Studies* 1 (1982), pp. 4-8.

[6] Benson, p. 39.

[7] Frederick S. Weaver, "A Study of Interdisciplinary Learning and Teaching at Hampshire College" (Amherst, MA: Hampshire College, 1981).

[8] Ralph Ross, "The Nature of the Transdisciplinary: An Elementary Statement," in Alvin White (ed.) *Interdisciplinary Teaching* (San Francisco: JosseyBass, 1981), p. 23.

[9] Benson, p. 40.

[10] Benson, pp. 41-42.

[11] Charles B. Fethe, "A Philosophical Model for Interdisciplinary Programs," *Liberal Education* 4 (1973), pp. 490-497.

[12] B. S. Bloom (ed.), *Taxonomy of Educational Objectives, Handbook I: Cognitive Domain* (New York: Longmans, Green, 1965).

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[13] Benson, pp. 43-44.

[14] William H. Newell, "Interdisciplinary Studies Are Alive and Well," *ms.*, p. 3.

[15] Newell, "Interdisciplinary Studies," p. 2.

[16] Thomas Klein and Jerry Gaff, "Reforming Higher Education: A Survey" (Washington, D.C.: Association of American Colleges, 1982), p. 4.

[17] Klein and Gaff, P. 6.

[18] Benson, p. 45.

[19] Benson, p. 45.

[20] Benson, p. 45

[21] Benson, p. 46.

[22] Newell and Green, p. 24.

[23] Benson, pp. 46-47.

[24] William H. Newell, "Interdisciplinary Curriculum Development in the 1970s: The Paracollege at St. Olaf and the Western College Program at Miami University," in Richard Jones and Barbara Smith (eds.), *Alternative Higher Education* (Cambridge, MA: Schenkman, forthcoming).

[25] Alvin M. White, "Developing and Challenging Faculty Through Interdisciplinary Teaching-Learning," in William C. Nelson and Michael E. Siegel (eds.), *Effective Approaches to Faculty Development* (Washington, D.C.: Association of American Colleges, 1980), pp. 71-76.

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THE CASE FOR/AGAINST INTERDISCIPLINARY STUDIES:
A COMMENT ON THE DEBATE

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> *"...I came to see that there are no economic, sociological, or psychological problems, but just problems, and they are all mixed and composite. In research, the only permissible demarcation is between relevant and irrelevant conditions. The problems are regularly also political and, moreover, must be seen in historical perspective."* Gunnar Myrdal[1]

> *"...For interdisciplinary educators,...two observable trends in American higher education are depressing. We are laboring in institutions which appear increasingly to value vocationalism, specialization, and compartmentalization with many faculty members identifying more readily with national professional groups than with local academic communities. And, correspondingly, the number of islands of innovative interdisciplinary educational experimentation and development is diminishing. Financial constraints, political conservatism, and student vocational orientation all are instrumental in this retreat from integrative education."* Jerry Petr[2]

The rather different perspectives on interdisciplinarity presented above open this comment because they capture nicely a significant part of my response to the provocative essays of professors Benson and Newell. My intention is to develop briefly the ideas implicit in those two statements, and then provide some elaborative support to two other important lines of argument which emerge from the Benson and Newell papers.

I like the first of the two comments quoted above because I think it is correct and insightful. And, in the context of the Benson-Newell dialogue, it asserts that, on the theoretical, conceptual, and philosophical level the integrationists win. At least in the social sciences, where I labor, there is no contest. Problems must be addressed and policies must be developed from an interdisciplinary perspective. For example, the assessment of the impact of unemployment on the United States is not solely an economic problem; nor is the evaluation of the consequences of multinational corporations; nor is the explanation of the flourishing "underground" economy in this country and elsewhere. And, of course, decisions about the use of an artificial heart are not simply medical questions; nuclear weaponry is not only a military issue; and school busing is not primarily a transportation problem. Life is interdisciplinary; students of life must be interdisciplinarians. The sorry state of our ability to understand and respond to problems such as those listed above reflects the failure of the traditional disciplinary approach.

I like the second quotation which introduces this comment because I think it too is correct and insightful. And, in the context of the Benson-Newell dialogue, it asserts that, on the existential, operational level Tom Benson's arguments against interdisciplinary studies seem to prevail. In practice, the criticism may well overwhelm the affirmations.

Consider that the school of interdisciplinary studies[3] which hosted our 1981 national meeting no longer exists. The interdisciplinary program[4] from which I was invited to the 1978 inauguration of the Association for Integrative Studies is gone. Nationwide, interdisciplinary programs appear to many as expendable frills in higher education, in part at least, due to the predominance of the Benson arguments in the court of (academic) public opinion.

Consequently, representing conceptual victory and practical defeat, many of us feel hollow and frustrated. And, as a response to those feelings, Bill Newell's agenda for action is appropriate. Unless we expand our efforts to generate, construct, clarify, and demonstrate the potential of interdisciplinary studies, the success and approbation which seem implicit in the philosophical validity of our position will not overcome the practical difficulties in their implementation.

To carry this comment a bit further, I would like to dwell briefly on an idea from each essay which, to me, merits amplification and development.

First, I want to emphasize, underline, and reinforce the occasional pedagogical themes in Newell's essay. Too often neglected as we discuss the content of interdisciplinary education, the pedagogical opportunities presented by high quality integrative studies need to be amplified.

Fundamentally, interdisciplinarity is mostly about questions, about problems and topics of "real world" concern. Disciplinarity, on the contrary, is mostly about answers, answers which are at least implicit in the methodology or paradigms which are at the heart of disciplinary education. And because interdisciplinary studies address questions of real societal concern, opportunities abound for active involvement of students with subject matter, rather than passive absorption of others' "truths."

This same question/problem orientation fosters confrontation of the interdisciplinarian (both student and faculty member) with the world as it is, stimulates the growth of tolerance for ambiguity and multiple perspectives, and elevates the art of questioning to the highest place in the educational process. Undergirding the pedagogical thrust of interdisciplinary education is the possibility of student development of cognitive, ethical, intellectual and moral dimensions as fundamentally discussed and described in the work of Piaget, Perry, Kohlberg, and other developmentalists.

The other side of the developmentalist coin is the possibility that Newell may give too little attention to the problems associated with sophisticated intellectual demands on students not yet prepared to deal with them. Asking the "concrete operational," "dualistic" student to address the complexities of genetic engineering, or human rights as a foreign policy plank presents pedagogical difficulties which should not be ignored. Interdisciplinary problems and curricula are exciting for academic professionals and stimulating for maturing students, but they may present baffling perplexities for the less advanced novice.

The caveats expressed in the preceding paragraph lead to the aspect of Benson's essay which I want to highlight. As interdisciplinary educators we must think well beyond the elegance and importance of our subject matter and maintain high levels of concern for what is happening to our students. We should remind ourselves that, for the most part, we, the exploratory faculty, are credentialed professionals with corresponding professional security. We have, again for the most part, a dissenting view of how the academy should function and how curriculum ought to be structured. But, on the other hand, our students are amateurs, apprentices in our care who ultimately must operate successfully within an academy which is, basically, disciplinary.

Students often must adhere to a disciplinary major. They must face the reality of a Graduate Record Exam or a Law School Aptitude Test or a Graduate Management Aptitude Test, or assorted other hurdles or obstacles rooted in a disciplinary view of the academic process. In my own discipline, economics, they must know all the arcane abstractions which have little relevance to understanding the role of the multinational corporation in the world economy, but which are most directly relevant to admission to a high quality graduate economics department.

The academic world as interdisciplinarians would like it, and the academic world our students must live in are different. We need some thoughtful restraint to our inclination to make students the vulnerable foot soldiers in our war against the academic establishment. I think Tom Benson's essay makes that point.

All in all, then, I conclude that Bill Newell has given interdisciplinary educators their marching orders; Tom Benson has shown them the walls they must scale. Newell is correct about the demands placed upon interdisciplinarians--demands of excellence, high standards and exemplary work. And Benson is correct about the consequences of failures to meet those standards. Given the correctness of the objective, and the significance of the task, who can avoid the challenge of making the effort?

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NOTES

[1] Gummar Myrdal, "Institutional Economics," *The Journal of Economic Issues*, Vol. 12, No. 4, (Dec. 1978), p. 772.

[2] Jerry L. Petr, "Can Progress Toward Interdisciplinary Education Be Built on a Disciplinary Base?" *Issues in Integrative Studies*, No. 1 (1982), p. 68.

[3] William James College, Grand Valley State Colleges, Grand Rapids, Michigan.

[4] Centennial Education Program, University of Nebraska-Lincoln.

WHAT DO YOU SAY TO A DEVIL'S ADVOCATE?

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What do you say to a devil's advocate, especially one who speaks with derision about those "interdisciplinary studies faculty driving curricular ice cream trucks down the academic alleys?" Do you thank him, admonish him, argue with him, ignore him, or "good humor" him? Or maybe--better yet--seek his salvation! Maybe, if we cleaned up our act, we might save his soul and ours. Certainly, some of our act does need cleaning up. Yet we must not deceive ourselves into believing that a cleaner act will convert large numbers of our foes into friends. The hard line protectors of the conventional, the established academic turfs, are not really open to persuasion, either by intellect or sterling performance. They have already made up their minds and employ whatever arguments they can fashion to rationalize their positions. I am reminded of the fate of the late Ernie Becker at the Berkeley campus of the University of California. Despite his considerable scholarly productiveness and a student body so impressed with his wide-ranging, interdisciplinary knowledge that they were willing to pay his salary, the "old men" of the departments declared him "persona non-grata" and forced him to leave the campus. Also, I am reminded of recent struggles on our campus over the control of enrollment in the general education program in which departments masked their actual vested interest objectives behind self-righteous declarations on the superiority of disciplinary education.

Benson, bless his soul, not only accepts these devilish declarations of disciplinary superiority, he puts them in an argument form that makes Satan look even better than he himself could ever imagine. Benson sets up a simplistic dichotomy in which disciplinary and "good" education are on one side, and interdisciplinary and "bad" education are on the other. Note the Bensonian juxtapositions:

Discipline	Interdiscipline
(good education)	(bad education)
coherent	confused
rigorous	romantic

(Continued)

fundamentals	diluted diversion
competence, critically based	shallow, popularly relevant topical studies
well-designed, sequential	disorganized variety show
cost-effective	expensive, gimmickry
high standards	dubious quality
leads somewhere, career, post-grad study	leads nowhere

It's downright insidious! Save us, oh Lord, from this image-trap presented so effectively by our putative friend. Naturally, we understand that the devil made him do it.

Of course, we all know colleagues who share some of these perceptions. And on many campuses there have been questionable educational efforts carried out under the banner of interdisciplinary studies which deserve criticism. On the other hand, conventional disciplinarians are responsible for quite a bit of lousy teaching and research. Obviously, those who allow this polar conceptualization to structure their perceptions will not "see" good work done by interdisciplinarians nor bad work done by disciplinarians. They are stereotypes in the most basic sense.

Stereotypes are highly resistant to change, despite loads of cognitive dissonance. Nevertheless, they are not invincible. If we want to increase our acceptance beyond the already committed interdisciplinarians and reduce our personal and program vulnerability, we must attack the perceptual barricades with both words and deeds. As Benson himself suggests we must seek both political and intellectual solutions to the real and image arguments against interdisciplinary studies that he poses: conceptual confusion, pedagogical and curricular laxity, inferior preparation for students, and higher costs of offering. I propose three solutions--one political, one intellectual, and one administrative and curricular.

My political solution involves co-option: define interdisciplinary very broadly as all activity which juxtaposes, applies, combines, synthesizes, integrates or transcends parts of two or more disciplines. While being respectable and defensible this definition enables us to encompass a substantial proportion, if not the majority of faculty at most multi-purpose institutions of higher education. The biggest programs which this umbrella covers are the applied professional ones--an area which Benson implicitly and inexplicably excludes. All areas of administration, for instance, are necessarily interdisciplinary--business, education, health, public, etc. Once, in a public meeting, I called our School of Business the largest school of interdisciplinary studies on campus. The Dean gasped but didn't openly reject the attribution. Other comparable professional areas include: nursing, social work, special education, home economics, engineering, journalism, broadcast and communication arts, design and industry, clinical science, recreation, criminal justice, etc. Of course, all of the topical studies to which Benson alludes are in the interdisciplinary archipelago, ranging from "old timers" like area studies through religious studies, gerontology, environmental studies, etc., to future studies. Even the so-called basic disciplinary departments have members with research and/or curricular interests that are cross-disciplinary in nature. They could have topical interests like those just mentioned or two discipline "hybrid" orientations like social psychology, bio-chemistry, musical ethnography, etc., or a shared interest in a method of data manipulation, e.g., statistics, computers.[1]

The basic political strategy is to define the generic term of interdisciplinary as appropriately inclusive as possible. The ultimate objective is to integrate interdisciplinary programs and faculty into the overall University structure. I am not suggesting full miscegenation, though that could happen in a few cases over time. Rather, I am arguing against the impermeable, little box approach to running organizations. A structural intertwining of identities and organizational networks reduces the opportunity for invidious characterizations, political isolation, paranoid scapegoatisms and the budgetary axe. During a period of austerity and educational retrogression a segregated ghetto of interdisciplinarity is especially vulnerable as the many cases of program dissolution over the last fifteen years have painfully demonstrated.

By incorporating a broad spectrum of venerable faculty and programs under the interdisciplinary mantle, we may give newer interdisciplinary programs a better chance of gestation and survival. Those who would plaster all new interdisciplinary efforts as faddish and inferior must use some care in their broadsides, as they may end up antagonizing a substantial segment of the faculty and administration. On our campus, for instance, though it wasn't easy, Women Studies was eventually successful with this strategy.

My second solution is the intellectual one. We must develop and disseminate, as Benson urges, interdisciplinary methodologies. We must struggle for a place in the academic sun for our "discipline of disciplines." Becoming an interdisciplinarian involves acquiring the same kind of disciplinary competence of which Benson speaks. In my view the minimal requirements include:

1. Identifying a feasible, limited area of disciplinary combination in which to ply one's epistemological trade. The

ognate areas of knowledge into which most of our colleges are rganized provide one set of possibilities, that is, natural cience, social science, creative arts or humanities. In my pinion there is no specialization in interdisciplinary studies, er se, but in interdisciplinary studies in something, namely, ome sensible combination of disciplines. I consider myself, or instance, an interdisciplinary social scientist. That nvolves working with seven different disciplinary perspectives ith some shared epistemological premises on a common subject atter, human behavior.

2. Becoming familiar with the basic disciplinary and sub-isciplinary perspectives, that is, the dominating explanatory nd interpretive strategies in one's area. Some disciplines ave more explicit orienting thought models than others, econ-mics, for example, as contrasted with political science; but ll disciplines have an organized mode of investigating, evalu-ting and interpreting statements about their subject matters r they would not have any claim to disciplinary existence. nowing these disciplinary, epistemological bases enables one o understand the meaning of a statement within its context and hy it differs from a statement, possibly on the same subject, rom another context.

3. Acquiring familiarity with the methods of determining truth" and "beauty" within the disciplines' purviews. One oes not need extensive training in statistics, for example, to ppreciate the knowledge-gaining strategies with which it is ompatible, its uses and limitations.

4. Learning several strategies of transdisciplinary integration with their advantages and disadvantages. Some trans-isciplinary approaches with overarching thought models which propose to replace prevailing disciplinary world views not only exist but are being widely utilized, for example, in the social sciences and beyond--general systems, Marxism, phenomenology, etc.

On the one hand, this four part approach to the profession of interdisciplinarity does not seek nor even desire a single, unified holism. On the other hand, it is much more sophisticated and enduring than putting a few disciplinary fragments to work on solving a social problem. Thus my approach escapes from another one of Benson's insidious dichotomies. And it can be taught at different levels of depth and sophistication.

Regardless of how well-defined our discipline becomes, interdisciplinarians should always cultivate and retain one of our more endearing traits, namely, flexibility, openness to new ways of doing things, a reasonable tolerance for challenges to the conventional--if you will--a little romanticism in our intellectual rigor. We also need to retain our sense of humor. Keep making up bumper slogans like Lu Mattson of Cal State - Sonoma - "Interdisciplinarians do it in any field.

The curriculuar and administrative solution is my third and last. Students must be given the opportunity to take interdisciplinary majors at the undergraduate and graduate levels. The basis for a core curriculum are the interdisciplinary skills outlined above while other courses chosen around coherent organizing principles complete the program. Undergraduate preparation of this kind in the social sciences is preferred by many graduate schools in areas such as business management, law, social work, public administration, etc. Graduate programs enable students to pursue in an organized and supported fashion those studies which are best comprehended with an interdisciplinary approach. Not incidentally, graduate programs also provide a place to socialize future generations of interdisciplinarians in the same way that other disciplines perpetuate their own.

Initiating and maintaining generic interdisciplinary studies majors is not easy. They are squeezed from both sides. Conventional-minded faculty and administrators can not see any intellectual or resource rationalization for separately established interdisciplinary programs with permanent faculty and majoring students. At the same time all those faculty who are committed to particular cross-disciplinary topics want their own majors with their own courses. For instance, my own interdisciplinary social science program at San Francisco State has provided the early support for many interdisciplinary areas which went on to create their own degree programs, in particular, urban studies, ethnic studies, women studies, labor studies, etc.

One partial solution to this squeeze game that we have tried at San Francisco State is cross-disciplinary minors. Minor curricula in cross-disciplinary areas such as criminal justice, gerontology, religious studies, human sexuality studies, holistic health, etc. are proposed and offered by faculty from various disciplines and interdisciplines. No additional permanent faculty are required. Most of the courses already exist, and consequently, the steady-state virtues are obvious--to some anyway. Students can take the minors in conjunction with a disciplinary or interdisciplinary major, overlapping courses in both cases, and actually using the minor as the cohering theme in the interdisciplinary major. Our administration and faculty senate have supported this cross-disciplinary minor approach in the past, although a recent critical accreditation report and a change in administration in my own school has dampened enthusiasm somewhat.

Consequently, I return to my earlier theme. No matter how successful we are in making "objective" progress in mitigating some of the real deficiencies pointed out so diabolically by Tom Benson--and we must do exactly that--we shouldn't expect a conversion of the conventional yahoos; after all, they've already made up their minds. And besides they only do it in their own fields.

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NOTES

[1] For a complete typology of cross-disciplinary activities in the social sciences see my article, "Varieties of Interdisciplinary Approaches in the Social Sciences," *Issues in Integrative Studies*, No. 1 (1982), pp. 12-20.

THE DEVIL'S DUE: SOME REFLECTIONS ON THE RESPONSES

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In my earlier paper, I shamelessly embraced the role of devil's advocate, hell-bent, one might say on marshalling some of the most damning arguments against interdisciplinary studies. I noted that I had checked the urge to respond to these arguments, not for want of inspiration, but in the interest of scaring up some serious efforts to rethink the case for interdisciplinary studies. Now, with the admirable papers of Professors Newell, Petr, and Miller, it is clear that the desired process is well under way. In this brief paper, I shall comment on some of the most general features of the three papers, wielding, alternately, the harp and the more familiar pitchfork.

Among the many appealing features of these papers is the balance they strike between realism concerning the constraints facing interdisciplinary studies programs and confidence regarding the future and worth of such endeavors. It has been said that a pessimist is simply a well-informed optimist. The papers by Newell, Petr, and Miller suggest, however, that in the case of interdisciplinary studies, an optimist might well be viewed as a well-informed pessimist. It is also gratifying to note the close attention that these papers give to the substance of the criticisms of interdisciplinary studies. The process of sorting out valid complaints from those objections based on prejudice and misinformation is as painful as it is important. Newell, Petr, and Miller recognize that a proper defense of our work must involve not only the correction of misperceptions, but also the rehabilitation of the theory and practice of interdisciplinary studies.

Each of the papers responds to the harsh challenge of my first argument, viz., that practitioners of interdisciplinary studies lack a coherent, defensible sense of their purposes. Newell, Petr, and Miller agree that however embattled interdisciplinary studies may be, it cannot be avoided. As Jerry Petr observes: "Life is interdisciplinary; students of life must be interdisciplinarians." An important task for those who seek a satisfying theory of interdisciplinary studies is the development of a clearer understanding of the relationship between the interdisciplinary structure of experience and the forms and methods of interdisciplinary study. With respect to this project, the papers by Newell and Miller provide some promising leads, but, alas, not much more. Their suggestive and closely related analyses of the role of the interdisciplinarian in tapping and juxtaposing the distinctive, often parochial, perspectives of the disciplines constitute, at best, a modest down-payment toward a more general theory of interdisciplinary studies.

We can agree with them that on all sides there are both practical and theoretical problems incapable of resolution within the confines of any one discipline. And it makes sense to interpret interdisciplinary studies as the larger arena in which such problems can be rigorously examined. So far, so good. We need more help, however, than either Newell or Miller has provided in understanding such things as the means by which the interdisciplinarian locates his problems, the characteristic structure or logical form(s) of the interdisciplinary problem, and the method(s) used by the interdisciplinarian in resolving such problems. With respect to the first of these concerns, Newell and Miller both recommend that the interdisciplinarian specialize. According to Newell, this may involve a focus as diffuse as the modernization process or as narrow as U.S. energy policy. Miller, on the other hand, appears to have broader themes in mind. In his own case, it is human behavior as seen in the diverse perspectives of the social sciences. There is something puzzling about this counsel to specialize. It appears to assume that one is first, for whatever reason, an interdisciplinarian and then only later, after due deliberation, a specialist. We need not be deeply troubled, however, by this somewhat odd arrangement. If it doesn't fit the facts of our own professional lives, it may, nevertheless, be a proper sequence for the next generation of interdisciplinarians. Having been imbued with a resolve to take a larger view of things, to avoid the "blindered" approach of the solitary discipline, the fledgling interdisciplinarian will move on to a decision concerning that area or aspect of life that will be his special interest.

There is another puzzle that cannot be brushed aside so easily. Here the question is: "What principles should guide the would-be interdisciplinary specialist in selecting his particular focus?" Obviously, personal interests and talents will play a large role; but is it also, ideally, a matter of finding an unusually complex interdisciplinary theme, one that engages a large number of disciplines? Or is it a matter of finding an especially significant, yet manageable problem, an apple ready to fall given the appropriate interdisciplinary maneuvers? Are there still other concerns that have a proper role in shaping the decision, e.g., social utility, pedagogical value, academic reform? If we are serious about the training of interdisciplinarians, especially at the graduate level, we must develop a better understanding of the nature of and motives for the movement from a "free floating" commitment to interdisciplinarity to a specific interdisciplinary focus.

A minimally adequate theory of interdisciplinary studies must also provide insight into the logical form of the interdisciplinary problem. Is it a problem posed within a specific discipline that demands extradisciplinary light for proper resolution? Is it a problem that is posed within several disciplines, albeit from different perspectives, but satisfactorily resolved within none of them? Or is it the "homeless" problem, the concern too broad to be posed, much less resolved within the limits of any particular discipline? Are there still other interpretations of the interdisciplinary problem? With respect to this matter, Newell and Miller offer only broad impressions. My guess is that Miller would accept each of the three interpretations as touching a distinctive kind of interdisciplinary problem. For Newell, however, it is apparently only the second and third interpretations that represent the essence of the interdisciplinary problem. Given the significant differences among the three interpretations, and their diverse and uncharted implications, not to mention the possibility of additional forms of the interdisciplinary problem, it is clear that we are still a long way from home in our quest for an adequate theory of interdisciplinary studies.

Having provided only casual guidance in locating interdisciplinary problems and in defining their structure, Newell and Miller prove equally sparing in their comments concerning the method(s) for treating interdisciplinary problems. Miller claims that the interdisciplinarian seeks something more than the combination of disciplinary fragments and something less than a "single, unified holism." Beyond this general information, however, he tells us little concerning the specific goals and methods of interdisciplinary study. If Newell is no more helpful in this matter, he is at least frank: "...it is not so clear what principles guide the interdisciplinarian in constructing a coherent response to the question out of the mutually incoherent disciplinary insights." It would be, of course, both dishonest and useless to contrive a step-by-step procedure, a recipe, for treating interdisciplinary problems; but we owe it to ourselves to develop at least a general account of the method or family of methods that are characteristically interdisciplinary.

The papers by Newell, Miller and Petr contain a wealth of persuasive ideas and recommendations with respect to the remaining four arguments in my paper. Particularly impressive is Newell's argument that interdisciplinary studies is not only possible for the undergraduate, but, indeed, indispensable if the student is to develop a proper orientation within the disciplines. Newell's allusions to his own apparently successful experience with a combined disciplinary/interdisciplinary approach to a social science course reminded me of the old farmer who when asked if he believed in infant baptism, replied, "Believe in it? Hell, I've seen it done." The publication and discussion of innovative approaches to interdisciplinary study, an important function of AIS meetings and publications, may accomplish as much or more than theoretical arguments in overcoming resistance to interdisciplinary programs.

The comments by Newell and Petr concerning the practical consequences of interdisciplinary studies for the student are also valuable. They note, for example, the unique potential of interdisciplinary studies in fostering such pedagogical values as tolerance for ambiguity and openness to multiple perspectives. As we develop a more precise and satisfying account of the nature and purposes of interdisciplinary studies, we can expect to discover many more such advantages and dividends. The realization of most of these benefits will depend, of course, upon a methodologically deliberate and explicit approach to interdisciplinary studies.

Both Miller and Newell are to be commended for their thoughtful remarks concerning strategies for the advancement of interdisciplinary studies. They have provided a number of fresh and stimulating ideas that deserve serious attention. The suggestions concerning graduate programs and the training of interdisciplinary faculty, for example, are especially compelling. Miller's "political solution" for what ails interdisciplinary studies is a case in point. Miller proposes a definitional capture of "a substantial proportion, if not the majority of faculty at most multi-purpose institutions of higher education" through a broad interpretation of the term "interdisciplinary." While Miller is correct in noting that the traditional disciplinary lines are widely and routinely breached throughout the university and that "de facto" interdisciplinary programs abound, his "co-option" strategy is, nevertheless, unpromising. What sets us apart from the traditional disciplinarians and most of those who work in the politically secure "interdisciplinary" fields, e.g., business administration, social work, nursing and criminal justice, is our explicit and generalized interest in the methods and values of interdisciplinary study. If the disciplines express distinctive world views, so too does the "discipline of disciplines." We believe in the power and worth of an approach to learning that is critically free and able to integrate insights from as many disciplinary areas as a given problem requires. We have earned our notoriety, for the most part, through being what we are--*challengers* of outmoded conventions, and *advocates* of a new academic order. Miller's broad umbrella ploy is unlikely, therefore, to fool anyone. It may, however, distract some of us from the demanding task of articulating and promoting our unique, if inchoate, vision of interdisciplinary studies.

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THE DIALECTIC AND RHETORIC OF DISCIPLINARITY AND INTERDISCIPLINARITY

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A. The Disciplinary Paradox

A discipline is usually defined as the specialized exploration of particular objects and subjects using particular methods, concepts, tools and exempla in addition to laws and theories which account coherently for the objects and subjects under study. Modes of inquiry are shaped both by external historical contingencies and internal intellectual demands, while innovations are tested in relation to a collective set of ideals, whether that means a formal paradigm or merely a preparadigmatic consensus. Adequate though this basic definition is, however, it fails to account for discrepancies which complicate the comparison of disciplinarity and interdisciplinarity:

(1) the sheer breadth of some disciplines

(2) the gap between a theoretically- and a practically-based definition of disciplinarity

(3) the different rates of change and degrees of receptivity among disciplines.

Physics, chemistry and anthropology have been called "federated disciplines" because they have many independent subdivisions. Some of those subdivisions even enjoy the independent status of disciplines, with their own professional associations, journals and programs of graduate study. Cytology, to cite one example, has grown considerably since the end of the nineteenth century. There are now numerous special Cytology societies around the world, and institutions such as the Biological Stain Commission serve its technological needs. While Cytology may not be taxonomically classed as a discipline, it does function sociologically as one. With disciplines grown so heterogenous and subspecialities so well defined, it becomes difficult, Wolfram Swoboda points out, to determine if the recipient of a Ph.D. in arctic biology from the University of Alaska is really practicing the same discipline as the holder of a degree in mathematical biology from Chicago or the holder of a degree in radiation biology from Rochester.[1]

Heinz Heckhausen observed further that disciplines with well-established vocational fields will tend to be eclectic rather than purist in their epistemological conception of themselves. Certain disciplines in the social sciences and especially in engineering center forthrightly upon questions of practice more than abstract theory. As a result, they have ready attachments to other disciplines which impinge upon the same social and technological problems. Some disciplines are also more conservative than others, slower to change. Others are more open to experimentation. Muzafer and Carolyn Sherif found that experimental psychology was interdisciplinary from its origins, borrowing from physics, physiology and mathematics: "The necessity of borrowing from these disciplines was so compelling that it was not considered interdisciplinary. It was simply the thing to do, not a matter to be argued about."[2]

Obviously there are considerable differences in the way disciplines conduct their activities which render a strictly dichotomous interpretation of the disciplinary/interdisciplinary relationship inadequate. Moreover, in much of interdisciplinary discourse, discipline usually means *department* and implies therefore the fixing of boundaries between divisions of knowledge more than a set of methods, concepts and theories. All of these factors have led to a disciplinary paradox in the discourse. It is usually called a "tension" or a "dilemma" but paradox is the most appropriate term, for there is an apparently contradictory situation which manifests itself in two concerns: (1) the role of the disciplines in interdisciplinary inquiry and (2) the necessity of interdisciplinary work assuming disciplinary features.

There is a schism in the discourse between what could be called the disciplinary position and the non-disciplinary position. The disciplinary position holds that disciplinary work is essential to good interdisciplinary work. It is important, as David Riesman contends, to have a disciplinary home.[3] Disciplines are the sources of instrumental and conceptual material for solving problems, the empirical base for integrative approaches, and the substance for metacritical reflection. There is even a belief that depth will lead to convergence, witnessed by the increasing convergence of theoretical levels in biology and chemistry. The non-disciplinary position is more scornful of the disciplines and often wishes to overturn the entire disciplinary structure. Yet, given the scope of disciplinary influence, proponents of both the disciplinary and the non-disciplinary positions have taken to deliberating upon the best way to *use* the disciplines.

The most developed method for using the disciplines is the dialectical approach. It is both critical and respectful of the disciplines. Corinna Delkeskamp used it when she defined the concept of "'disciplined' interdisciplinarity" as a complement to disciplinary study. She opposes the view which Piaget and others have of a contradictory relationship between disciplinarity and interdisciplinarity because of the tension between nonbounded and bounded perceptions of knowledge upon which it rests. It is based, she answers, upon making ontological boundary assumptions.

Delkeskamp holds instead the view that fields have a "liability" to consider each other's issues and to reflect upon their own in terms of the other. This puts the question of the relationship on a considerably higher level of metacritical reflection.[4]

Delkeskamp's notion of interdisciplinarity as a dialectical critique has a methodological counterpart in Muzafer and Carolyn Sherifs' definition of interdisciplinary coordination as a validity check. They see the substantive problem at the core of interdisciplinary work to be revealing the fundamental need disciplines have for each other as checks upon the validity of their own generalizations and theories. Hence, the most important obligation is knowing what concepts have to be borrowed and what transactions are necessary to insure the validity of disciplinary formulations.[5] In both Delkeskamp's and the Sherifs' theories, the identification of essential relationships is of primary importance.

Jonathan Broido used the dialectical approach as a practical, methodological heuristic to overcome "disciplinary entrenchment" by using it in instrumental, problem-oriented work. Broido's developmental conception of interdisciplinarity evolves in three successive states and offers one of the few models of interdisciplinary training in the disciplines:[6]

(1) naive honesty: an attempt to explicate and elucidate the minimal framework presuppositions behind each discipline (its "naive philosophy"). The question is: "What would be the minimum we would have to presuppose if we took the language of our discipline as part of a way of talking about things in general?"

(2) radical egocentricity: the attempt "to apply the minimal framework of a discipline to the widest range of problems, and in particular to problems outside what members of a discipline may regard as its proper domain." There is a distinction between the effective domain of applicability of a discipline (the range of problems that could be solved effectively in its present state of the art) in each stage of its development and its theoretical range of commitment ("the range of all problems that could be interpreted as problems for a discipline, given the minimal general framework").*

(3) instrumental sublation: the comparing of disciplinary formulations and solutions of

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*As Broido points out, one of the major problems of interdisciplinarity is that members of a discipline often take "effective domain" to represent "range of commitment."

> problems in terms of *inner complexity*, *explanatory utility*, *predictive power* and *information-theoretic measures that combine syntactic, semantic*, and *statistical features*.

Instrumental sublation makes it possible to compare the instrumentalities of different disciplines for different problems and then to map their instrumental dependence and independence. It also, Broido suggests, helps transcend interdisciplinary misunderstandings, animosities and competitions, "not because it tries to gloss over them, or mitigate them by democracy, but because it takes them seriously enough and attempts to spell out what such differences mean and what would be their consequences."[7] It makes the price of reductionism clearer and demonstrates the interdisciplinary strength of a given disciplinary framework. Furthermore, it exposes the possibilities for exporting and importing disciplinary methods and terminology.

The first part of the paradox--the essential use of disciplinarity--leads to the second--the essential role of disciplinary behavior and structure in interdisciplinary inquiry. Kenneth Boulding addressed the problem for general systems, oft touted as one of the most promising of interdisciplinary approaches. One might expect philosophers would have had a place for general systems. Yet they were "hostile," viewing it as "an amateur threat to professional interest." Necessarily then, to gain respect and a place, general systems faced an inevitable dilemma, which Boulding not surprisingly conceives in organic, systemic terms:[8]

> Unless, therefore, general systems itself becomes a discipline, and an intellectual species, the other species in the intellectual ecosystem are likely to regard it more as a virus that threatens them than as a food to sustain them.

What, however, is the price? Boulding already recognized a certain loss of generality:[9]

> The identification of general systems with systems science and especially with large-scale computer modeling may threaten its philosophical growing edges, even though systems science itself has a great deal of validity as a discipline.

The only choice, Boulding suspected, may well be to practice both disciplinarity and interdisciplinarity. There might be "a niche," he thought, for general systems as a "kind of quasi-masonic order, a quasi-secret society, among those who have to be good little disciplinary boys and girls outside the lodge in order to survive, but who have a hankering for a larger view, a broader perspective than can be found in single departments or disciplines."[10] That would recognize the importance of discipline itself as a process of detecting error and distinguishing good from bad work. Yet it would also show that discipline is inadequate if it is "too self-contained and too much closed to information from the outside."

Becoming disciplinary in this sense is justified for several reasons. It means moving from the catalyst stage so popularly associated with interdisciplinary exploration to the substantive stage of interdisciplinary inquiry. When tied to the detection of error and the value of an epistemic community for testing new work, "discipline" has an undeniably positive value. When tied to the danger of prematurely settling upon one working paradigm to demonstrate solidarity or dealing with the problems attendant to maintaining departmental status, it has negative connotations. In those cases "discipline" signals the threat to invention and exploration which gave rise to the interdisciplinary alternative in the first place. What is most important is the problem of self-containment and it is here that the paradox is firmly seated. Containment is necessary for consolidation and development. Yet it sets in motion the definition of parameters.

A few examples are in order.

The first is that of immunopharmacology. It emerged as a specialty out of recognized needs and interrelationships. The overlap between pharmacology and immunology was acknowledged some time ago. Research of "an immunopharmacological nature" was conducted early in the century by Paul Erhlich, who was working with antitoxins in search of specificity of treatment. The resulting specific receptor concept established links between immunology and pharmacology in the early 1900's. Later, some of Erhlich's contemporaries applied the receptor theory more widely and then, in the 1940's, structural chemical approaches to immunological specificity were founded. Other early and later investigations further forged these links but the emergence of a subspecialty depended, as it so often does, on the fuller development of both parent fields.[11] Immunopharmacology advanced from its early role as an appendage to bacteriology to a much wider view in teaching, research and administration. It was able to grow from simply practical applications (vaccines, skin tests, diagnostic antisera, blood groups and allergic reaction) to exploration of its theoretical structures when chemists, zoologists and geneticists started building a new conceptual structure for the field. Several publications and a new journal now support the concentrated study of immunopharmacology. There were two books bearing the title published in the mid 70's, one in 1975 and the other in 1977. Then in 1979 the *International Journal of Immunopharmacology* was created to provide a forum for disseminating and testing new work in the field.

The success of future work in immunopharmacology will depend on immunologists and pharmacologists becoming more sophisticated in knowing each other's work. They must also become more knowledgeable about the principles and new techniques of chemistry and physics, so they may better understand chemical manipulation of the immune system.[12] That progress, however, will raise new problems in training in immunopharmacology.

Janice Lauer considered those problems when she thought about how graduate students could be trained in the study of written discourse. The majority of theorists in this new field are members of English departments who have been investigating, as Lauer defines it, "the causes of increasing illiteracy and developing 'new rhetorics' to account for the processes of pedagogy of written discourse, especially those kinds of discourse ignored by literary studies."[13] From the start, their study has had a "multidisciplinary cast." They saw the field not as a *tabula rasa* but as a place for building on relevant work in other fields and for using investigative methods refined elsewhere.[14] Their questions about the nature of the writing process, the interaction among writer, reader, subject matter and text as well as their speculations about "the epistemic potential of writing and its implications for improving powers of inquiry" led them into foreign domains. They moved into classical rhetoric, transformational and tagmemic linguistics, semiotics and speech-act theory. They made psychological studies of creativity, problem-solving and cognitive development. They also ventured into philosophical studies like those of Gadamer, Johnstone, Perelman, Toulmin, Polanyi and Kuhn. There they found theories which helped them deal with the problem domain defined by the dissonance they had experienced "between their responsibility for composition and the inadequacy of their understanding and training for it."[15] They also used several modes of inquiry: historical studies, theoretical research, linguistic analysis, hermeneutic studies and empirical work.

Their "multimodality" has its risks and advantages. The vastness and density of their problem domain has a certain "subtle seduction," Lauer explains. Multimodality helps to avoid near-sightedness and cultivates a "fruitful reciprocity among modes":[16]

> Historical studies have kept the field from reinventing the wheel; theoretical work provides guidance and hypotheses for empirical research, which, in turn, offers one kind of test or validation of theory. Hermeneutical and linguistic studies buttress and act as heuristics for theory development.

In addition, connected as they are to praxis in the classroom, composition studies enjoy a constructive interplay between empirical and theoretical modes. Yet, there are problems. The "burden of comprehension" demands knowledge of not just what is borrowed from another field but its context, history and status in that field. Then, training must be defined and negotiated with English departments.[17]

Multimodality can create further problems in that camps may develop around certain modes and certain disciplinary dominances. That happened in both social psychology and in American studies. Social psychology is probably the most frequently cited example of an interdiscipline. Characterized in its early days by the work of Alport, Sherif, Champman, Volkmann and others, it deals with problems lying between sociology and psychology.[18] Yet there is a controversy about the two social psychologies, one psychological and the other sociological. They have different methods, theories and foci. Sociological social psychology has tended to use survey research, with an anti-experimental, anti-laboratory bias. Psychological social psychology tends to center in laboratories and favor experimentation, with more interest in intra-personal, cognitive concerns than extra-personal, social-structure concerns. What has resulted in most discussions is what Thomas Blank calls "a dichotomy on the basis of disciplinary identification."[19] David Wilson and Robert Schafer even concluded after a survey to determine differences between the two social psychologies, that they weren't very interdisciplinary after all.[20] Still, social psychology has moved in directions which separate it from its parent disciplines. Moreover, concepts such as symbolic interaction have been borrowed back in the parent disciplines, demonstrating the kind of influences that can develop between original disciplines and new interdisciplinary inquiries.

Both the problems of disciplinary dominance and premature settling upon one holism plagued American studies. It was accused of becoming "disciplinary" because it took on departmental trappings, and it concentrated at an early point on a search for the American mind as well as the critical method of myth and symbol analysis. Since American studies grew out of interactions between English and History departments, it also retained those disciplinary dominances, with the relegation of social-science methods to a periphery. Those biases have come under vigorous attack from several quarters, including the attack on the consensus search for the American mind in history, the analysis of limitations to myth/symbol cricitism in literature departments and American-studies forums, as well as the complaints from ethnic and minority groups that their voices were excluded not only by traditional disciplines but by American studies as well.

Although the debates have been rather tense at times, they have taken place before multiple audiences, a phenomenon characteristic of interdisciplinary inquiry and ultimately productive of wider dialogue. There is debate directed at external critics of American studies, generally in the form of demonstrations of current working premises, new research and information-rich retorts to outside attacks. There is debate between American studies and the minority forum which split off to develop their own deeper and wider forums for developing and testing new perspectives against the current American studies philosophy, not altogether different from the kind of debate that often develops between subspecialties and mainstream disciplinary views. The debate has been genuinely productive in several ways. Women's studies has published some of its analyses of the American studies/women's studies relationship in important American studies journals and is usually regarded as the most developed of the ethnic/minority studies. Ideas and concepts about American culture which were developed in American studies teaching and research are finding their way back into History, Literature and even Anthropology departments. Unfortunately, now that a lot of the studies programs are being dismantled in budget cutbacks, their efforts are undermined and the debate severely limited. Yet, discussion continues not only in what interdisciplinary journals and associations do survive, but in the new perspectives which have penetrated traditional disciplinary research programs.

What comes through these examples most clearly is the power of community in defining, conducting and evaluating interdisciplinary work. Ronald Grele defined a "community of interest" in oral testimony, a field among those whose work and practice "is dependent upon knowledge of the contextual analysis of the spoken word."[21] Like immunopharmacology, oral testimony emerged because of particular developments in its two core disciplines, in this case linguistics and anthropology. Moreover, the possibilities for intellectual integration were recognized among the subdisciplines of psycholinguistics, sociololinguistics, ethnohistory and ethnomethodology studies. In older, more traditional disciplines, such new methodologies and practices as oral history, English as a second language and the linguistic study of poetics fostered new awareness of the voice as "a medium through which information is conveyed." Finally, there were other forces encouraging the study of people face to face in the field: the academic revolution of the 60's, the declining job market and a concern for broad cultural analysis.[22] Oral testimony had, Grele explained, "its own impetus toward interdisciplinarity" because the material could not be exploited within the narrow conventions and methods of specialties. While the disciplines and subdisciplines of oral testimony have not emerged as an integrated field of study, their interpenetration is becoming more obvious and Grele himself has outlined a framework for incorporating the interpenetrating disciplines. Two points about his proposal are noteworthy. First of all, his critical review of the field appeared in *American Quarterly*, a major journal for American studies which regularly features bibliographical essays on important subspecialties as well as an annual bibliography which alerts scholars to work in various fields. Second, Grele stipulates that field workers in each discipline concerned with oral testimony must learn what kinds of information other investigators need and familiarize themselves with the technical needs of those in other fields. Finally, they must collectively produce materials usable by the widest range of investigators. They must assume Lauer's "burden of comprehension." They must also recognize their liability for other disciplinary and subspecialist interests in the material under interdisciplinary investigation. They must work through forums which not only serve the needs of their "community of interest" but also continually reappraise those needs in light of the multiple audiences which comprise the interdisciplinary dialogue.

They must, in short, practice discipline with regard for the breadth of their community and the complexity of their domain.

B. The Interdisciplinary Interrogation

(With special reference to Area Studies)

David Riesman suggested that attacks on disciplinary boundaries have become so widespread that they are now "Part of the standard repertory of criticism from outside and inside American higher education."[23] The particular kinds of criticism embodied in interdisciplinarity include various forms of protest against fragmentation, the scrutiny of disciplinary demarcations of "real life" and a questioning of such internalized intellectual dualities as theory vs. fact and theory vs. action. The interrogation of disciplinarity rarely proceeds from a well-developed theory of interdisciplinarity. What usually happens is that people begin apparently "interdisciplinary" work because of either inadequacies or limitations in their singular perspectives. In the process of doing the work they invariably begin making definitions of the interdisciplinary character of their work and also at some point attempt to determine the new relationship between their interdisciplinary inquiry and their disciplinary bases. There is evidence of this everywhere but perhaps the most dramatic demonstration is in the history of the interdisciplinary concept in area studies, American studies and various ethnic/minority studies.

Robert Sklar was clearly interrogating the disciplines when he called in "American Studies and the Realities of America" for a focus upon the "necessary connection" between our participation in both academic *and* public communities.[24] Sarah Hoagland was making a similar interrogation when she protested on behalf of women's studies against "gross omissions and distortions in the form as well as the content of the traditional disciplines."[25] Annette Kolodny's three propositions for feminist literary criticism challenged prevailing canons, paradigms and values not just on the grounds of methodological convenience but also philosophical validity. Feminist criticism was not just a new way of thinking about old material but an assault upon "that dog-earned myth of intellectual neutrality."[26] Interdisciplinarity had become necessary because traditional disciplines had failed to integrate women into their perspectives. Because of those omissions and even outright rejections, outside efforts must now *push* the disciplines, not just "nudge" them as Henry Nash Smith had argued early on for American studies. Interdisciplinary programs, Ellen Boneparth hoped, would therefore achieve three purposes:[27]

(1) *an overview* to merge limited, specialized concerns

(2) *an exploration* of "the interstices of related fields to draw out the truths that lie between the disciplines"

(3) *a development* of comprehensive approaches to

problem solving (to "apply new-found knowledge to old and new problems").

These interrogations were not just endogenous but exogenous as well. Women's studies was "a vehicle for change and expression," an integral part of the larger feminist movement. Raising consciousness is a political and an intellectual process which is interdisciplinary because, as Marilyn Salzman-Webb explained, a philosophy of knowledge attentive to "the forms and functions of power" cuts across disciplines.[28] Arthur Kroker made a similar argument in *Canadian Studies* when he called for a "critical reinvention of Canadian discourse," a revision of the bourgeois episteme in favor of "a method, a style, of scholarship which is simultaneously public, discursive and archeological" (in Foucault's sense). The "vacant interdisciplinarity" which mechanically crosses disciplines using "integrons" of normalization must be replaced by "critical interdisciplinarity," a "collective deliberation on public problems." Yet, that can happen only if there is "an active migration beyond the disciplines to a critical encounter with different perspectives on the Canadian situation," including "the creation of a vigorous pluralism of outlook on Canadian society."[29] The interdisciplinarian becomes therefore, an archaeologist attempting to recover lost discourse. S/he corrects what is incomplete or falsified by vacant and normalized consensus. Interdisciplinarity is then, for Kroker, a truly Foucaultian process of "rediscovery" and "rethinking," of resocialization" and reintellectualization."

The argument for interdisciplinarity was clearly multiple. It rested first upon a traditional claim for seeing the whole instead of the disciplinary parts. It was then augmented by the need for self-defined epistemologies. For some this sets up a destructive contradiction which subverts the possibility of settling upon an explanatory holism. For others it is a contradiction of creative tension which can be at least partially resolved. Russell Thornton, to illustrate, claims that Indian Studies must be allowed to define and build its own intellectual traditions: its oral traditions, its perspectives on treaties and treaty rights, tribal government, forms of organization, group persistence and American Indian epistemology.[30] That would satisfy not only the external need for becoming a discipline--to meet the pressure for "legitimacy" and ensure program survival--but it would also satisfy the "endogenous" need--the internal pressure for self-definition. The argument for interdisciplinarity then widened with the alignment of knowledge to action, the solving of community problems. There is a job to be done. With action as the "guiding criterion for formal knowledge," the model for a Black studies scholar becomes, Maurice Jackson contended, a medical scientist, a doctor who brings pure and applied knowledge into closer relationship in order to improve life in the Black community.[31] American Indian studies, Thornton explained, focused on teaching and service rather than scholarship for deliberate reasons.

The evaluation of our assumptions about the knowledge/action relationship is by no means confined to interdisciplinary discourse. It is part of a broad post-Cartesian critique of mainstream dualistic thinking in the West. However, the theme has a special magnitude in interdisciplinary discourse. Some argue that late twentieth-century problems are so profound that research and teaching must be devoted exclusively to their solution. Others argue more moderately that problem-solving teams, research centers and interdisciplinary programs should be given more prestigious presence in the academy. We should alter the internal status hierarchy which prizes knowing over doing. Others argue this has happened all along, that the distinction between pure and applied knowledge has never been entirely accurate anyway. It is an ideal informed by tradition and the prestige of high-level theory. It assumes that disciplines are theory-centered and that society's problems are therefore outside the scope of pure disciplinary study. The artificial ideal sets up what Sinclair Goodlad calls "the drift to purity and fixing."[32] What actually happens is an intermixing of values. "The two aspects of claims to knowledge--the pragmatic and the theoretical--are," Robert Merton explained, "partly independent of each other, authentically coinciding on occasion, turning up severally, and sometimes being altogether groundless."[33]

In his 1980 presidential address to the Association for Asian Studies, Benjamin I. Schwartz spoke to a further dichotomy:[34]

> The questions that confront us at this point are:
>
> What is a theoretician, and what is a gatherer of facts? What is a theory and what is a fact? Anyone familiar with current literature in the philosophy of science will be aware that these are not simple questions. At one extreme one can find the view that there are no such things as bare statements of facts. In the words of Karl Popper, "all observations are theory-impregnated."

Facts uncovered from their prior silence or suppression were not just "bare" facts but theoretical challenges, contentions that conventional axioms were partial, if not flawed or subversive. New facts were not new "bare" facts, but the primary substance of unadorned new theories. New gestalts were ushered in as "new voices" speaking and in some cases shouting out at "the cutting edge," one of the fondest of phrases for interdisciplinarians. The charges of intellectual and cultural ethnocentrism coming from ethnic/minority studies were not unrelated to the spreading attack on Western ethnocentrism in area studies. In both area studies and the domestic cultural studies there was a broad, post-World War II scrutiny of the way both disciplinary and cultural knowledge had been circumscribed by authoritative categories and specious dichotomies. The interdisciplinary interrogation was therefore a disciplinary, a cultural and an epistemological critique.

Area studies expanded in universities as crash programs designed to supply information about foreign cultures, though national political needs supported very specific markets for area specialists. Like area studies, Black and women's studies, American studies and other studies of cultural and geographical identity, were trying to fill voids but some tried to do it from the underside--by demand rather than in demand. Hence, the less "necessary" area studies faced the same obscurity and disregard which plagued domestic studies of the underside, though even scholars in the sought-after studies had to work past received models and disciplinary dominances, often ironically enough past colonialist pigeon holes whose political needs had given birth to those very studies. Yet, in seeking to expand knowledge by going beyond disciplinary parochialism, those studies encountered a parochialism quite common in interdisciplinary work.

Recalling the experience of African geographical studies and comparative regional development, Edward Soja concluded that whatever interdisciplinary qualities formal studies had in the United States, "Area studies specialization created another form of rigid compartmentalization within the social sciences."[35] Area specialists were uniquely isolated by geographical distance, the need for second-language mastery and an ethnographical model which demands years in the field. The geographical parochialism of being so far removed from disciplinary homes obviously hindered analysis, but area specialists were further isolated by the problems of working in broad areas where limited models would not suffice. This recreated, Soja recalled, enormous problems of scholarly discourse:[36]

> African geographical studies, for example, could often be done without critical evaluation by other non-Africanist geographers. And if necessary, one could shift audiences whenever convenient. Other disciplinary specialists in the same region could be viewed as not having the necessary background and skills of the geographer, while other geographers could be dismissed as not knowing enough about the "real Gabon." Such academic broken field running exists within disciplines as well, but seems to reach a higher level in area studies.

There were other problems as well, including a consequent mediocrity in embryonic critical work and aggravation of the theory/fact imbalance. Peter Eckstein defined the imbalance in area studies:[37]

> Originally created chiefly to correct imbalances in factual knowledge, they have by now contributed to an imbalance of another kind: between factual knowledge of alien countries, chiefly of the "humanistic" kind, and our ability to make theoretical sense of that knowledge--to solve general theoretical problems in macropolitics (many of which were initially genera-

ted in area studies.)

In area studies that humanistic imbalance arose in part, Eckstein explained, because languages and history were already organized along geographical divisions: hence, they were the ones who "could best muster critical masses of personnel for programs of non-Western studies (anthropology aside)."[38] Yet, there was another reason as well. At that time in political science, problems of a general-theoretical nature were ill defined. Consequently voids were filled with empirical work which did in part counteract disciplinary parochialism but created a distinct reputation for area specialists. Chalmers Johnson likened the role of an area specialist in a discipline to a "supplier of raw materials":[39]

> ...rather like a Bantu miner, chipping away at the cliff face of a South African mine, who is supposed to ship the unrefined ore off to the master goldsmiths living elsewhere--in this case, to "generalists," or "theorists," or comparativists" toiling away at New Haven, Cambridge, Ann Arbor, or the Stanford "think tank," here the data will be processed.

Other studies were aware of the same problem. Elaine Showalter found feminist literary criticism and scholarship to be "stubbornly empirical" on the whole. Yet, the stark theory/-data dichotomy projected an overly severe image of data hackers. Such starkness plagued Warren French's attempt to figure out the relationships between popular culture studies and American studies in 1974: "...popular culture studies are fundamentally 'hardware' studies', whereas American studies involve principally 'software.' The function of popular culture studies is to study the objects themselves, to describe them, and to try to find out what makes them tick internally and tock externally." It was American studies (like "British studies, Black studies, Gypsy studies, whatever cultural group may be under consideration") which would provide integrating theories. Popular culture studies would "punch the cards," while American studies would "provide an intellectual framework for suggesting orderly approaches to the chaos of data pouring in from many sources."[40] Tidy and timely though the metaphor was, it is as stark as the image of a Bantu miner in Area studies. Even French soon backs off it a bit. He envisions popular culture studies functioning as a discipline only if it contemplates "a certain restricted body of material" *and*--here is where the metaphor falters--if it develops specialized theories about it. American studies itself would function as a discipline, French continued, if it took those popular-culture "theses" and used them along with other "expert sources" to formulate "inter-disciplinary syntheses." The metaphor is not entirely invalid in that popular culture does a specialized kind of work that aids in the larger attempt to understand American culture. It is, however, too stark in its binary opposition. The metaphor works to the extent that it pictures American studies as an interdisciplinary meta-discipline, akin to the notion in interdisciplinary discourse of a federated discipline. Yet, it places too much responsibility for generating interdisciplinary synthesis in the hands of American studies. Some of the "software" inevitably comes from popular culture explorations of the relationship between its specialized material and theories adequate to explain it both internally and externally.

There is much more to all of this than a diptych with data gatherers on one panel and theory builders on the opposite panel. Johnson himself defied the simplistic dichotomy in Area studies with a more apt metaphor: "rather like the Third World itself, a good many nationalizations are going on: the theorists have not been sending back very good theories to the field, and some of the commodity suppliers are going into manufacturing themselves."[41] Writing from his own experience in Latin American Studies, Kalman Silvert also defined the dichotomy in an economic analogy:[42]

> Would that life so ordered itself. This view of "natural" process is highly reminiscent of the trickle theory in economics, the belief that a well primed pump will be made to continue to shower some water on everybody, for reasonable and rational men will see the personal advantage of keeping consumers alive. The trickle theory breaks down, among many other reasons, because unequal power distributions all too often prevent the flow from permeating the entire society, even most inequitably. Analogously, the flow of data from "areas" to the disciplinary mills and out to the "areas" dries up because the mill is unable to process the raw material; it cannot convert "information" into "data" without changing its own nature, without grappling with the fact that area studies came into existence because of the very ethnocentric limitations of the disciplines.

The outcome in area studies was a kind of interdisciplinary "paradigm drama," in that it showed the development of a critical dialogue between the disciplinarians and the area specialists. As disciplinarians became more interested in political development, the esteem of area specialists was strengthened: first, Lucian Pye recalls, "because the non-Western world attracted for a time the attention of leading theorists in most of the social science disciplines"; then later, "because when disillusionment over rapid development took place the area specialists generally had the most convincing explanation for why the deeper character of politics in Asia and Africa inhibited the emulation of Western development."[43] Area specialists moved from the margins of the expanding field of political science and saw their status in the profession change as a result.

Even the most avowedly separatist of interdisciplinary studies is rarely divorced from its parent disciplines and contiguous research areas because it is always testing those

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relationships. The example of area "specialisms," as they are sometimes called, is quite compelling. Collaboration with other specialists and the combined search for new and wider explicandum led to changes in research questions and the nature of dialogue with the disciplines. Pye called the nonlinear progress of the dialogue a pattern of zigzags because, while the structure of knowledge and training may not have changed dramatically in separate academic disciplines, area specialization did change perspectives and raise questions which went to the foundations of the social sciences. Some of the tension was resolved as area specialists gained experience in social science methods and disciplinary specialists gained experience in area research.[44]

The critical function of interdisciplinary interrogation is clearly that of provoking dialogue upon the assumptions and demarcations of disciplinarity and the possibilities of alternative and wider perspectives. Therefore, the attempt to clarify disciplinary perspectives is an important part of many interdisciplinary investigations, not just to illuminate their limitations but to suggest future queries.

C. The Rhetoric of Interdisciplinarity

There is an inevitable paradox of language when talking about interdisciplinarity. Our vocabulary, indeed our entire modern logic of classification, predisposes us to talk in terms of disciplinarity. That predisposition manifests itself in several ways, but the most striking is a geopolitical metaphor which establishes a conceptual structure in the discourse. Along with other metaphoric conceptual structures it reveals a great deal about the need for and justification of interdisciplinary activities. Metaphor is not merely a linguistic decoration but is central to human thought processes. George Lakoff and Mark Johnson have discovered that our categories of everyday thought are largely metaphorical and that everyday reasoning involves metaphorical entailments and inferences. Metaphor is a form of "imaginative rationality" which both reflects and creates our conceptual realities.[45] To omit the study of a subject's metaphorical structures then is to omit one of the most important perceptions and constructions of the subject.

Interdisciplinarity is metaphorically structured by more than one concept; but the most obvious, the surface structure, is that of geopolitics. Geopolitical language is not uncommon in discussions of knowledge. We have been mapping knowledge into spheres, world, fields, provinces and kingdoms for some time. In fact, when they studied the relationship between the curriculum and the disciplines, Arthur King and John Brownell found a world of "methodological imperialism" between fields.[46] In that world the chief activity is dispute over territory, not just in education and research but even in medical-care teams, where a patient becomes the "turf" of specialists. In the logic of the geopolitical metaphor as it appears across interdisciplinary discourse, a discipline is "private property" with "no tresspassing notices,"[47] a "domain" with its own "turf." A field is an "empire," and a graduate division a "territory."[48] Each separate scientific domain is a "balkanized region of research principalities,"[49] "feudalized" like other scientific disciplines into separate "fiefdoms."[50] Locked in their "autonomous fiefs,"[51] their "bastions of medieval autonomy," the disciplines nurture their "academic nationalism," keeping departmental turf "jealously protected"[52] and "domain assumptions" firm.[53]

However, "floundering expeditions into territories already explored by other disciplines" disturb the status quo. So do ventures to the "borderlands" and the "frontiers" of knowledge, advanced as they are by "cutting-edge questions."[54] Where once "no interdisciplinary interlopers invaded,"[55] there is "alien intrusion."[56] The map now shows "enclaves" of interdisciplinarity, "little islands"[57] occupied by interdisciplinarians who argue for "transdisciplinary cosmopolitanism,"[58] for new structures and "global strategy."[59] Yet, with the "annexing" of "satellite disciplines,"[60] there is resistance, for no disciplines willingly abdicate their "mandated sovereignty."[61] Interdisciplinarity faces a full-scale problem of "foreign policy,"[62] and "bi-lateral treaties"[63] may be in order.

Geopolitical portraiture is so central to interdisciplinarity because, as Robert L. Scott declared, there is a "distinctly political face to the circumstances in which interdisciplinary efforts must thrive or not."[64] Disciplinary structure is so firmly rooted in modern institutions of teaching and learning that it is nearly impossible to structure an argument for interdisciplinarity without at least passing recognition of that social and political reality, especially when such academically "tarnished groups" as Marxists and generalists are involved.[65] Moreover, as Lakoff and Johnson discovered, we conceptualize argument as war:[66]

> Your claims are *indefensible*.
> He *attacked every weak point* in my argument.
> His criticisms were *right on target*.
> I *demolished* his argument.
> I've never *won* an argument with him.
> You disagree? Okay, *shoot*!
> If you use that *strategy*, he'll *wipe you out*.
> He *shot down* all of my arguments.

In short, we don't just present arguments for doing something, we win and lose them. The concept, the activity and the language of argument are partially structured by the metaphor of war. This rhetorical reality is heightened in the case of interdisciplinarity, grounded as it is so often in very specific sociopolitical circumstances.

Given those circumstances, it is not surprising to find the rhetoric of belief affixed to the rhetoric of suzerainty and war. To experiment with disciplinary knowledge is to tamper, to "meddle with" the "preordained,"[67] to disturb the "intellectual idols," to suggest tearing off the "labels which still decorate the pediments of the university temples,"[68] even to challenge the "awe-inspiring pontiffs."[69] The "sheer force of orthodoxy" drives disciplinarity into a fixed hole, like an ostrich with its head in the ground.[70] Disciplinarians who "sing out of the same prayerbook"[71] find "right doctrine" in their journals.[72] Yet, the interdisciplinary impulse is to "convert" the specialists into generalists, just as they were once "baptise[d]" into specialists. The specialists may have "worked their alchemy,"[73] but the generalists too enjoy certain powers and even had a "Bible" in the Harvard redbook on general education.[74] Interdisciplinarians have staged "revivals" and dispatched their own share of "missionaries." They even have their own "frequent strain" of "millenial interdisciplinarity," advanced by a "scornful prophetic minority" with its corner on "some special Truth."[75]

The belief turns ideological for those who see interdisciplinarity as the "implement for a blithe liberation"[76] and for those who use it as a "vehement protest" against fragmentation.[77] Universities are described as "prisons with hermetically sealed cells for inmates with the same record,"[78] disciplinary jargon as "suitable discourse" for translating new "arsenal concepts,"[79] and laboratory research in psychology not just as a paradigm of practice but "the most efficient and powerful weapon" in the "social psychological research armamentarium."[80] Little wonder, once the dust has settled, that some will have "moved their careers to safety within traditional departmental boundaries."[81]

The arguments for change are both provocative and productive because the imperialism cuts both ways. While resisting attempts to ursurp their data and theory in the name of interdisciplinarity, disciplines may well be asserting their own imperialistic claims. Rhetorician Wayne C. Booth sees such imperalistic claims forcing matters into "the courts of communal discourse,"[82] where separate rationalizations are "transmuted." Just as cross-pressures in voting can free individuals from traditional positions, the "intellectual cross-pressures" of interdisciplinarity may yield new outlooks.[83] Disciplinary imperialism is not altogether unhealthy, Andre' Lichnerowicz advises, for it obliges other disciplines to "receive, accept and modify points of view and to use concepts, methods and techniques that have come from elsewhere." The "master words" and "master concepts" of one discipline are less likely to turn into "intellectual idols."[84]

Beneath the combative surface picture, there is another conceptual structure which goes beyond the geopolitical circumstances to describe the epistemology of interdisciplinarity. At first glance we find just what we might expect. The physicist looks at interdisciplinarity in terms of elements and particles of knowledge, the mathematician in terms of subsets, the biologist of symbiotic ideals and fecundity, the economist of market strategies, the anthropologist of disciplinary ethnocentrism and tribal rivalries, the systems theorist of feedback and cybernetic relation, the sociologist of sibling rivalries... and predictably so on. Still, there is a distinct pattern of language and argument. The languages of mathematics, physics, biology and general systems have been particularly prominent in the discourse. Knowledge is mapped as clusters of lines and coefficients, sets and subsets, and as "powerful vectors" present along a continuum "from subatomic particle to gallaxy[sic].[85] There is an easy union of mathematical, formal logical and physics languages, talk of the "locus," "vectors" and "clusters" of knowledge not just among disciplinary users of such language but increasingly among others who have found them appealing, if not downright fashionable. "Sets," "subsets" and "material fields" are described at their "overlapping patterns," their "nexus" points and even at a "center of gravity." Most of all, they are not static sets. Knowledge is usually pictured in interdisciplinary discourse as a dynamic system moving vigorously at the "frontiers of convexity" and advanced by "fission" and "fusion," the two most popular scientific terms for describing change.

In the second half of this century, particularly, there has been an oscillation between the metaphors of the machine and the organism. There is a lot of talk about "interfacing," the most popular term borrowed from the language of computer systems.[86] When questions and problems arise, it takes an "interfacing" of knowledge and practical approaches to solve them. Stored programs must be adapted to new information,[87] the "through flow" of people used productively, the "operator" and the "entrepreneurs" marshalled. But to do that, Nevitt Sanford argues, generalists must synthesize and address the "dynamics of specialized knowledge, whose sudden thrusts within a limited sector of a social system create imbalances in the whole."[88] Leo Apostel, one of the early theorists who uses cybernetic language, has in fact developed an elaborate market productivity metaphor to illustrate the best possible "operations" for interdisciplinarity in society as a whole.

Still, the dominant metaphor of a system is an organism. The organic metaphor has enjoyed favor in interdisciplinary discourse because it establishes interdisciplinarity as a natural, ingenerative process. That metaphor stresses evolution and fluctuation of knowledge rather than structural foundations or states of equilibrium. The image of an organism puts knowledge in "live relationships," a combination of macroscopic relationships in which the mental complexity of the human mind finds for several writers a ready analogue in the workings of the ecosystem. The "hybrid vigor" of interdisciplines, the "symbiotic ideal" of the Meikeljohn curriculum, the "symbiosis" of an interdisciplinary curricular model: all demonstrate the synergistic value of interdisciplinarity. In a recent book entitled *Interdisciplinary Teaching*, general education is described as "in the wind," a "growing swell."[89] It becomes easy, in fact organically proper, for biologist Lewis Thomas to see a poem as a healthy organism.[90] The natural model of the bodily paradigm regains its appeal in Carl Hertel's article, "Toward an Energic Architecture," while language in poetry is likened to the molecule with its functional information.[91]

The organic metaphor further invites the metaphor of pathology in writing upon education. The wrong kind of knowledge is dead knowledge. The "dreaded poison" of specialization requires the "antidote" of interdisciplinarity. The university is beset by "hardening of the arteries" and the patient needs "surgery."[92] However, there is a risk. As Michaud and Briggs put it, "how can new organs capable of changing the whole organism be transplanted without killing him?"[93] If specialization is a disease, interdisciplinarity is not progress but "a symptom of the pathological situation in which man's theoretical knowledge finds itself today."[94] In the most extreme version of the metaphor, professors are "authoritatively performing their appropriate mortuary rites," cast as undertakers in charge of corpses of dead knowledge and threatened by changes which ought to be seen as natural, "benign developments," not "destructive disasters to be resisted."[95]

Growing use of the organic metaphor seems almost a fulfillment of the forecast C.C. Abt made in his working papers prior to the 1970 Centre for Educational Research and Innovation seminar:[96]

> It seems that consideration of the dynamic life cycle of a discipline has more insights to offer than the static, taxonomic view of the division of scholarly labor. Viewing disciplines as organic entities may prove to be a more productive analogy than architectural ones offer. We can at least look for what feeds the growth or poisons the survival of a discipline, and what groups of disciplines coexist in harmonious fecundity spawning new disciplines through interdisciplinary intercourse, using the organic analogy.

Contiguous disciplinary relations are described in language accentuating natural relations: their "links," "symmetry," "convergence," "conjuncture," "interactions," "integration" and "interface." Interdisciplinary work is perceived as a process of natural mediation along "intercultural," "interdependent," "interstitial," "intersectional," and "interdepartmental" lines. Problems anthropomorphically elude the "grasp: of a single discipline and "refuse" to stay within boundaries. Ultimately the organic metaphor corresponds to the geopolitical metaphor in that it is a definition of the "natural" place and the "inherent" need for interdisciplinarity in that geopolitically conceived environment. It is the identification of natural place against historically-determined divisions.

Diffusion and Non-Linearity

The organic metaphor was not conceived in interdisciplinary discourse. It comes from a much wider discussion of the nature of modern knowledge. Yet, because interdisciplinarity is so concerned with the conditions of modern social and intellectual circumstances, certain metaphors have special power and presence in the discourse. Interdisciplinarians use them to heighten their perception of reality and on occasion advance that perception with fresh metaphors. While the organic metaphor is very powerful and popular, there are other metaphors which picture the role of interdisciplinary activities.

In looking at "Diffusion of Information Across the Sciences," A. J. Meadows described research in one specialty "corresponding to the deeper and deeper drilling of a mine shaft." Information transfer across the disciplines is rather like "interconnecting tunnels" between those vertical shafts.[97] Others have used various compatible images of knowledge. Landau, Proshansky and Ittelson wrote of "the twilight zones of complete ignorance" lying between the vertical pillars of knowledge, the self-isolated disciplines.[98] In an address on "Interdisciplinary Scholarship," delivered to the ninth meeting of the Council of Graduate Schools, S. Aronoff spoke of crossbreeding and interdisciplinary development below the surface of all sciences, with the possible exception of pure mathematics. Vertically-oriented disciplines might be "loosened" enough to allow horizontal diffusion and "spill over" of knowledge. Few know this better, Aronoff suggested, than the biologist,[99]

> ...who has seen his area grow, in my lifetime, from an almost completely descriptive one, where only human physiology had the beginnings of quantitative levels, to today's arena involving, at the populational levels, the most sophisticated aspects of applied mathematics and, at the subcellular levels, combinations of physics, chemistry, and mathematics which, not too long ago, were considered the sacred domains of those disciplines alone. Analytically, the development in biology resulted not from the increasing sophistication of the biologist, but from the "spillover" of physicists and chemists (along with some of their curriculum) into biology. For example, in physics, the kind of physical optics common twenty years ago, is given scant shrift. The physics department course in physical optics is now given in terms of scatter theory, with a level of sophistication in mathematics beyond the present-day biochemist. The latter, utilizing physical optics routinely, must now teach physical optics in his own--frequently a biology--department.

There are other images as well. Chains of overlapping neighborhoods, overlapping fish-scales, honeycombs, fluctuating systems: they all describe relations, associations and affiliations. If they do not admit the prospect of total unification, they certainly express the inherent correctness of complementarity and compatibility. Perhaps the best-known, single, organic metaphor is Donald Campbell's fish-scale model of omniscience. Campbell has proposed an ideal model to encourage "narrow interdisciplinary specialties" and thereby discourage disciplinary ethnocentrism. In this model, narrow specialties are visualized as individual fish scales. Existing disciplinary clusters leave interdisciplinary gaps because of a "redundant piling up of highly similar specialties." To ease that redundancy, Campbell advocates organizational changes which would decrease the "dyscommunicative" consequences of these gaps. Here he pictures the difference between present clusters and the ideal fish-scale model:[100]

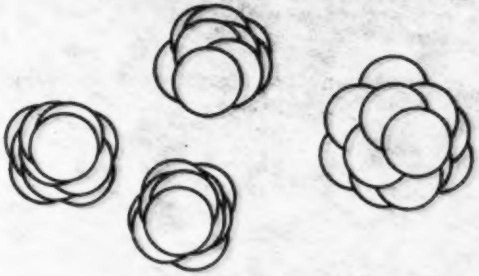

Fig. 1a-Present situation: Disciplines as clusters of specialties, leaving interdisciplinary gaps. (Campbell, Donald T. "Ethnocentrism of Disciplines and the Fish-Scale Model of Omniscience," *Interdisciplinary Relationships in the Social Sciences*, ed. Muzafer and Carolyn W. Sherif. Chicago: Aldine, 1969), p. 329.

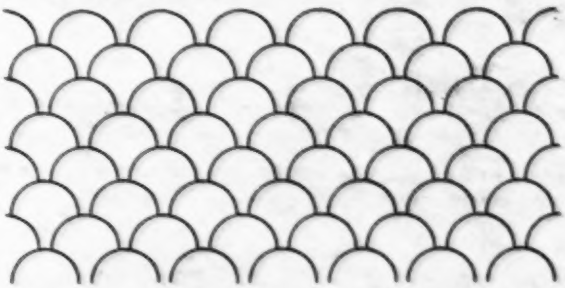

Fig. 1b-Ideal situation: Fish-scale model of omniscience. (Campbell, Donald T. "Ethnocentrism of Disciplines and the Fish-Scale Model of Omniscience," *Interdisciplinary Relationships in the Social Sciences*, ed. Muzafer and Carolyn W. Sherif. Chicago: Aldine, 1969), p. 329.

Campbell makes several assumptions in presenting this model. He begins by attacking "the myth of disciplinary competence." He argues that the image of scholars competent in one discipline is unrealistic. In reality, "congeries of narrow specialties" cover only a small percent of a discipline. Competence is collective because no one scholar embodies disciplinary breadth. Competence emerges from the overlapping of narrow specialties.[101] The "fish-scale ideology" demands a restructuring of the system. The old myth of unidisciplinary competence is dropped in favor of "crossdisciplinary reading and conventioning," and "uniform omniscience" is replaced by novel specialties, novel ranges of competence and new administrative structures which facilitate communication across the disciplines. They do not just loosen up the vertical pillars of knowledge. They replace them. That is a typical feature of nonfoundationalist metaphors.

In describing his coherentist theory of knowledge, a network model which aims at explanatory unity, Nicholas Rescher reviewed metaphors which reflect these new pictures of knowledge. While Rescher does not himself discuss interdisciplinarity, the metaphors of his coherentist model are well known in interdisciplinary discourse, particularly as they contrast to traditional views based upon linear and univocal models of knowledge:[102]

COHERENTIST MODEL OF NICHOLAS RESCHER

--the axiomatist-- (a traditional Euclidean cognitive systematization)	--the coherentist-- (Rescher's network model of cognitive systematization)
• a foundation, as in a building whose stones are laid tier by tier	• enmeshment
• "the essentially linear order of an expository book, especially a textbook"	• "the inherently network-style ordering an entire library of an encyclopedia
• a tree-like structure supported by a firm-rooted trunk"	• "a node of a spider's web which is linked to others by thin strands of connection, each alone weak, but all together adequate for its support"
• linearity: proceeding "by fresh deductions from novel premises," and "advance into new informative territory"	• cyclic process: "In a position to cycle round and round the same given family of prospects and possibilities, sorting out, refitting, refining..."

- "the sketching of an orderly tree"
- "the drawing of a complex map," "a chain-mail network"

Such non-linear images describe not only knowledge in general but also the particular patterns of interdisciplinary inquiry. Commenting on disciplinary/interdisciplinary relations, Lucian Pye likened the growth of knowledge in interdisciplinary Area Studies to a pattern of zigzags. At first area specialists sought to gain skills and concepts from the disciplines. Yet while doing that they combined their own advancing theories, sophisticated knowledge of areas and culture, as well as interdisciplinary methods with those disciplinary skills and concepts. As they gained confidence, those area specialists then "shifted their tacks" and questioned the utility of disciplinary concepts developed from Western perspectives."[103] Gene Wise invoked both the images of a journey and concentric circles for the interdisciplinary study of American culture. Wise argued that human experience "takes place within a range of particular environments, or surrounds." Because any surround may be connected to another, we can picture "concentric fields" raying out from a center of widening circles of influence. Our task becomes that of locating connecting links as we journey through those fields of experience. The process is multiple and open, never singular and closed. Such an approach is typically interdisciplinary because it emphasizes exploration and renewed discovery. Scholarship, Wise concluded, is not a series of discrete *contributions*--"like building blocks in a pyramid"--but a series of *dialogues*--"transactions with an unfinished, an inherently unfinishable world of cultural experience."[104]

Two final metaphors deserve summary comment because both speak to the tension between analysis and synthesis which is such a prominent theme in the discourse. Julian Huxley used a popular image when he advocated reforming science on a "centripetal, convergent pattern," to alleviate the damage of its present "non-pattern" of centrifugal and often divergent trends. Les Humphreys and many others have likewise argued that interdisciplinary thought has "centripetal power."[105] Huxley himself was uncomfortable with interdisciplinary terminology. He felt changing to a centripetal pattern required a problem focus, "a concentrated attack on specified problems." To avoid using the "fashionable" term of "multidisciplinary," he would prefer to call it just "plain cooperative." Terminological quibbles aside, Huxley arrived at the centripetal position for the same reasons many interdisciplinarians do. Intercommunication, cross-contact and cross-fertilization constituted "a kind of reproductive union, producing new generations of scientific offspring, like biophysics or cytogenetics." The separate sciences, on the other hand, were behaving like galaxies in an expanding universe: "diverging at increasing rates from some central position towards some limiting frontier."[106]

Both Huxley and B.M. Kedrov spoke at the same international colloquium on the theme of science and synthesis, organized by

UNESCO to mark the tenth anniversary of the deaths of Alfred Einstein and Teilhard de Chardin as well as the fiftieth anniversary of the theory of general relativity. Kedrov posited a metaphorical model for the advancement of science, a symmetrically truncated cylinder:[107]

> According to the angle it makes with the plane, its projection on the plane may be a circle, a triangle, a square, or all three at once--like shadows projected upon the ceiling and two different walls.

Thus,

> From the point of view of simple analysis, the aspect of the object-model changes according to the standpoint from which it is viewed. But from the synthetic point of view, the different aspects of the model can be seen to belong to the same object by relationships which can be determined.

Integration depends upon synthesis and synthesis takes account of analytic data. By first studying the projections individually, by breaking down the geometrical image of the body into its "constituent elements," then reconstructing on a theoretical level, science can move, Kedrov concludes, "from the one to the many, and from the simple to the compound."

Huxley's view is more organic in that he sees interdependencies and intercommunication as centripetal forces, as established processes of reproduction. Kedrov's view is more mechanical in that he achieves integration by manipulating the cylinder and by moving from the part to the whole. That manipulation corresponds to the image of loosening horizontal lines and choosing to work in the zones between the established vertical pillars of knowledge. The difference is important. The organic image assumes there are linkages which have been obscured or even damaged by divisions which developed out of historical contingencies. The view that those natural connecting forces will reestablish connecting links is the dominant ideal of interdisciplinary discourse. Yet, it is for the most part just that, an ideal against which efforts towards integration and the mediation of potential solutions to problems are measured. The day-to-day reality of interdisciplinary work is that centripetal power does not function of its own accord. The interdisciplinarian therefore manipulates projections of synthesis and resolution. In that final sense, the root organic metaphor is a description of philosophical premises, while the geopolitical metaphor is a definition of the circumstances which make interdisciplinarity an architectonic, constructive art of resolving the tension between analysis and synthesis.

The interdisciplinary idea appears in a considerable variety of circumstances, from high-level presumptions of unity across the sciences and powerful holistic paradigms to more modest searches for relationships among disciplinary clusters and instrumental resolution of conflicting approaches to a single problem. However, despite that variety, there are common claims and goals which the metaphoric conceptual structures expose in their own rich and various textures. The most central claim is that of place and the dominant method is that of discerning the means to achieve integrative and synthetic thought amidst disciplinary structures and strategies which are seen as both complement and contradiction in the eyes of different theorists. Regardless of the theorists' ultimate philosophies, however, it is very clear that the dominant conception of interdisciplinarity is that of a productive art of restoring and discovering the grounds for interdependence and relationship.

# # # # #

FOOTNOTES

[1] Wolfram Swoboda, "Disciplines and Interdisciplinarity, A Historical Perspective," *Interdisciplinarity and Higher Education*, ed. Joseph J. Kockelmans (University Park: The Pennsylvania State University Press, 1979), p. 53.

[2] Muzafer and Carolyn W. Sherif, "Preface," *Interdisciplinary Relationships in the Social Sciences*, ed. Muzafer and Carolyn W. Sherif (Chicago: Aldine, 1969), p. xii.

[3] David Riesman, "The Scholar at the Border: Staying Put and Moving Around Inside the American University," *The Columbia Forum* (Spring 1974), p. 29.

[4] Corinna Delkeskamp, "Interdisciplinarity: A Critical Appraisal," *Knowledge, Value and Belief*, V. II of the *Foundations of Ethics and Its Relationship to Science*, ed. H. Tristram Engelhardt, Jr., and Daniel Callahan (Hastings-on Hudson: The Hastings Center, Institute of Society Ethics and the Life sciences, 1977), p. 339.

[5] Muzafer and Carolyn W. Sherif, "Interdisciplinary Coordination As a Validity Check: Retrospect and Prospects," *Interdisciplinary Relationships in the Social Sciences*, pp. 3-20

[6] Jonathan Broido, "Interdisciplinarity, Reflections on Methodology," *Interdisciplinarity and Higher Education*, pp. 278-279

[7] Broido, p. 281.

[8] Kenneth Boulding, "The Future of General Systems," *Interdisciplinary Teaching*, ed. Alvin M. White (San Francisco: Jossey-Bass, 1981), p. 109. Number 8 of the *New Directions for Teaching and Learning Series*.

[9] Boulding, p. 109.

[10] Boulding, p. 109.

[11] Peter W. Mullen, "Editorial, An Immunopharmacology Journal: Relfections on Its Interdisciplinary and Historical Context," *International Journal of Immunopharmacology*, *1:1* (1979), p. 2-3.

[12] Mullen, p. 3.

[13] Janice M. Lauer, "Studies of Written Discourse: Dappled Discipline," a manuscript copy of the introductory essay for a forthcoming collection of essays on studies of written discourse. This essay is a printed version of an address Professor Lauer made before The Rhetoric Society of America at the 34th Annual Meeting of the Conference on College Composition and Communication in Detroit, Michigan on Thursday, March 17, 1983. I thank Professor Lauer for making a copy of the manuscript available to me.

[14] Lauer, p. 8.

[15] Lauer, p. 2-4.

[16] Lauer, p. 8.

[17] Lauer, p. 9.

[18] Swoboda, p. 65.

[19] Thomas O. Blank, "Two Social Psychologies: Is Segregation Inevitable or Acceptable," *Personality and Social Psychology Bulletin, 4:4* (1978), p. 553.

[20] David W. Wilson and Robert B. Schafer, "Is Social Psychology Interdisciplinary," *Personality and Social Psychology Bulletin, 4:4* (1978), p. 548.

[21] Ronald J. Grele, "A Surmisable Variety: Interdisciplinarity and Oral Testimony," *American Quarterly, 27* (August 1975), pp. 276-277.

[22] Grele, pp. 276-277.

[23] David Riesman, p. 26.

[24] Robert Sklar, "American Studies and the Realities of America," *American Quarterly, 22* (Summer 1970 Supplement), p. 597.

[25] Sarah Hoagland, "On the Reeducation of Sophie," in *Women's Studies*, An *Interdisciplinary Collection*, ed. Kathleen O'Connor Blumhagen and Walter Johnson (Westport, Connecticut: Greenwood, 1978), p. 17.

[26] Annette Koloday, "Dancing Through the Minefield: Some Observations on the Theory, Practice and Politics of a Feminist Literary Criticism," *Feminist Studies, 6* (Spring 1980), p. 8.

[27] Ellen Boneparth, "Evaluating Women's Studies: Academic Theory and Practice," *Women's Studies*, An *Interdisciplinary Collection*, p. 23.

[28] Marilyn Salzman-Webb, "Feminist Studies: Frill or Necessity?" *Female Studies V*, ed. Rae Lee Siporin (Pittsburgh: Know, 1972), p. 67.

[29] Arthur Kroker, "Migration from the Disciplines," *Journal of Canadian Studies*, 15 (Fall 1980), 3.

[30] Russell Thornton, "American Indian Studies as an Academic Discipline," *The Journal of Ethnic Studies*, 5 (Fall 1977), pp. 10-13.

[31] Maurice Jackson, "Toward a Sociology of Black Studies," *Journal of Black Studies*, 1 (December 1970), p. 134-35.

[32] Sinclair Goodlad, "What Is an Academic Discipline," *Cooperation and Choice in Higher Education*, ed. Roy Cox (London: University of London, 1979), p. 12. Available as ERIC document 181 836.

[33] Robert S. Merton, "Social Problems and Sociological Theory," reprinted in *Social Research and The Practicing Professions*, ed. Aaron Rosenblatt and Thomas F. Gieryn (Cambridge: Abt Books, 1982), p. 45.

[34] Benjamin I. Schwartz, "Presidential Address: Area Studies as a Critical Discipline," *Journal of Asian Studies*, 40 (November 1980), p. 18.

[35] Edward Soja, "African Geographical Studies and Comparative Regional Development," *Geographers Abroad, Essays on the Problems and Prospects of Research in Foreign Areas*, ed. Marvin Mikesell (Chicago: University of Chicago Press, 1973), p. 167.

[36] Soja, p. 167.

[37] Harry Eckstein, "A Critique of Area Studies from a West European Perspective," *Political Science and Area Studies, Rivals or Partners?*, ed. Lucian Pye (Bloomington: Indiana University Press, 1975), p. 215.

[38] Eckstein, p. 205.

[39] Chalmers Johnson, "Political Science and East Asian Area Studies," *Political Science and Area Studies*, p. 81.

[40] Warren French, "'An Odorous Tangle of Blossming Vines': Popcult Confronts the Cultist," *The Indiana Social Studies Quarterly*, 26 (Winter 1974-75), pp. 18-19.

[41] Johnson, p. 81.

[42] Kalman H. Silvert, "Politics and the Study of Latin America," *Political Science and Area Studies*, p. 155.

[43] Lucien W. Pye, "The Confrontation between Discipline and Area Studies," *Political Science and Area Studies, Rivals or Partners?* ed. Lucian W. Pye (Bloomington: Indiana University Press, 1975), p. 20.

[44] Pye, p. 1.

[45] George Lakoff and Mark Johnson, *Metaphors We Live By* (Chicago: The University of Chicago Press, 1980), p. 193.

[46] Arthur R. King, Jr. and John A. Brownell, *The Curriculum and the Disciplines of Knowledge, A Theory of Curriculum Practice* (Huntington, New York: Robert E. Kriefer, 1976), pp. 74-75.

[47] Stanley Milgram, "Interdisciplinary Thinking and the Small World Problem," *Interdisciplinary Relationships in the Social Sciences*, ed. Muzafer and Carolyn W. Sherif (Chicago: Aldine, 1969), p. 119. In the narrative amalgram of metaphorical expressions, I am citing for the most part works which summarize dominant attitudes.

[48] William Mayville, *Interdisciplinarity: The Mutable Paradigm* (Washington, D.C.: American Association for Higher Education, 1978), p. 1. AAHE-ERIC *Higher Educational Research Report* #9.

[49] Robert Dubin, "Contiguous Problem Analysis: An Approach to Systematic Theories about Social Organization," in *Interdisciplinary Relationships in the Social Sciences*, p. 68.

[50] Rustum Roy, "Interdisciplinary Science on Campus, The Elusive Dream," *Interdisciplinarity and Higher Education*, ed. Joseph J. Kockelmans (University Park: The Pennsylvania State University Press, 1979), p. 162.

[51] J. R. Gass, "Preface," *Interdisciplinarity, Problems of Teaching and Research in Universities* (Paris: Organisation for Economic CoOperation and Development, 1972), p. 9.

[52] Marvin W. Mikesell, "The Borderlands of Geography as a Social Science," in *Interdisciplinary Relationships in the Social Sciences*, p. 237; Ernest L. Boyer, "The Quest for Common Learning," in *Common Learning, A Carnegie Colloquium on General Education* (Washington, D.C.: The Carnegie Foundation for the Advancement of Teaching, 1981), p. 18.

[53] Used by Alvin W. Gouldner in *The Coming Crisis of Western Sociology* (New York: Basic Books, 1970) and by Rustom Roy, p. 168.

[54] Used by Arnold A. Rogow, "Some Relations between Psychiatry and Political Science" and Kenneth D. Roose, "Observations of Interdisciplinary Work in the Social Sciences," in *Interdisciplinary Relationships in the Social Sciences*, pp. 278 and 324 respectively.

[55] Rustom Roy, p. 168.

[56] Martin Landau, Harold Proshansky and William H. Ittelson, "The Interdisciplinary Approach and the Concept of Behavioral Science," *Decisions, Values and Groups*, ed. Norman Washburne (New York: Pergamon Press, 1960), p. 11.

[57] Pierre Duget, "Approach to the problems," in *Interdisciplinarity: Problems of Teaching and Research in Universities*, p. 13.

[58] William J. McGuire, "Theory-Oriented Research in Natural Settings: The Best of Both Worlds in Social Psychology," in *Interdisciplinary Relationships in the Social Sciences*, p. 28.

[59] Leo Apostel, "Conceptual Tools for Interdisciplinarity: An Operational Approach," in *Interdisciplinarity: Problems of Teaching and Research in Universities*, p. 164.

[60] Heinz Heckhausen, "Discipline and Interdisciplinarity," in *Interdisciplinarity: Problems of Teaching and Research in Universities*, p. 87.

[61] Joseph J. Kockelmans, "Why Interdisciplinarity?" *Interdisciplinarity and Higher Education*, p. 135

[62] John Higham, *Writing American History, Essays on Modern Scholarship* (Bloomington: Indiana University Press, 1970), p. 28.

[63] Geoffrey Squires, "Discussion" in response to Guy Berger's "Introduction," *Interdisciplinarity Papers Presented at the Society for Research into Higher Education Symposium on Interdisciplinary Courses in European Education, 13 September 1975 (At City University, London)*. (London: Society for Research into Higher Education, Ltd., August 1977), p. 9.

[64] Robert L. Scott, "Personal and Institutional Problems Encountered in Being Interdisciplinary," in *Interdisciplinarity and Higher Education*, p. 312.

[65] Brooke Hindle, "A Bridge for Science and Technology," *American Studies in Transition*, ed. Marshall W. Fishwick (Philadelphia: University of Pennsylvania Press, 1964), p. 120. Hindle originally used this expression in reference to Marxists and scholars who attempt to make generalizations and comparisons without adequate grounding in or understanding of science.

[66] Lakoff and Johnson, p. 4.

[67] Gass, p. 9.

[68] Andre Lichnerowicz, "Mathematic and Transdisciplinarity," *Interdisciplinarity: Problems of Teaching and Research in Universities*, p. 121.

[69] Muzafer Sherif, "Crossdisciplinary Coordination in the Social Sciences," *Interdisciplinarity in Higher Education*, p. 214.

[70] Muzafer and Carolyn Sherif, "Interdisciplinary Coordination as a Validity Check: Retrospect and Prospects," *Interdisciplinary Relationships in the Social Sciences*, p. 8.

[71] Dubin, p. 67.

[72] Murray Wax, "Myth and Interrelationship in Social Sciences: Illustrated Through Anthropology and Sociology," *Interdisciplinary Relationships in the Social Sciences*, pp. 86-87.

[73] Edward Joseph Shoben, Jr., "General and Liberal Education: Problems of Person and Purpose," *Interdisciplinary Perspectives*, *4:1* (Spring 1972), p. 8.

[74] Boyer, p. 6.

[75] Scott, p. 319

[76] Guy Berger as quoted by Guy Michaud in "General Conclusions," *Interdisciplinarity: Problems of Teaching and Research in Universities*, p. 287.

[77] Kockelmans, "Why Interdisciplinarity?," p. 149.

[78] Kockelmans, "Why Interdisciplinarity?," p. 149.

[79] Lichnerowicz, p. 122.

[80] McGuire, p. 22.

[81] Donald T. Campbell, Ethnocentrism of Disciplines and the Fish-Scale Model of Omniscience," *Interdisciplinary Relationships in the Social Sciences*, p. 339.

[82] Wayne C. Booth, "Mere Rhetoric, Rhetoric, and the Search For Common Learning," *Common Learning*, p. 37.

[83] Milgram, p. 103.

[84] Lichnerowicz, p. 122.

[85] Jack Lee Mahan, Jr., "Toward Transdisciplinary Inquiry in the Humane Sciences," An Unpublished Dissertation. United States International University, San Diego, 1970, p. 136.

[86] See especially the work of Rustom Roy and Kenneth Roose as well as Nancy Anne Cluck, "Reflections on the Interdisciplinary Approaches to the Humanities," *Liberal Education* (Spring 1980).

[87] Silvan S. Tomkins, "Personality Theory and Social Science," *Interdisciplinary Relationships in the Social Sciences*, p. 201.

[88] Nevitt Sanford, "The Human Problems Institute and General Education," *Daedalus* (Summer 1965), pp. 646-647.

[89] See *Interdisciplinary Teaching*, ed. Alvin M. White (San Francisco: Jossey-Bass, 1981), p. 7. #8 (December 1981) of the New Directions in Teaching and Learning Series.

[90] Lewis Thomas, "The Natural World," *Common Learning*, p. 112.

[91] Carl H. Hertel, "Toward an Energic Architecture," *Interdisciplinary Teaching*, p. 86.

[92] Asa Briggs and Guy Michaud, "Perspectives: Context and Challenge," *Interdisciplinarity: Problems of Teaching and Research in Universities*, p. 191.

[93] Briggs and Michaud, p. 191.

[94] Kockelmans, "Why Interdisciplinarity?," p. 146.

[95] Vincent Kavaloski, "Interdisciplinary Education and Humanistic Aspiration," *Interdisciplinarity and Higher Education*, p. 229; and Clark C. Abt, a restricted document of the Centre for Educational Research and Innovation, "One Description and One Ideal Model and Implications for University Organisation for General, Professional and Lifelong Education and Research (Note by the Secretariat)," p. 6. Abt presented these papers at the 1970 Centre for Educational Research and Innovation seminar on interdisciplinarity but they do not appear in the 1972 published book from the seminar. For providing me with this and other documents and granting me permission to quote from them, I thank Helen M. Benyahia of the Paris office for the Organisation for Economic Co-Operation and Development.

[96] Abt, working paper, pp. 5-6.

[97] A. J. Meadows, "Diffusion of Information Across the Sciences," *Interdisciplinary Science Reviews*, 1:3 (September 1976), 259.

[98] Landau, Proshansky and Ittelson, p. 16.

[99] S. Aronoff, *Interdisciplinary Scholarship*. Address to the Nineth Annual Meeting of the Council of Graduate Schools in the United States. 5 December 1969. Available as ERIC document ED 035 365. pp. 4-5.

[100] Campbell, p. 329.

[101] Campbell, pp. 330-331.

[102] Nicholas Rescher, *Cognitive Systematization, A Systems-Theoretic Approach to a Coherentist Theory of Knowledge* (Oxford: Basil Blackwell, 1979), pp. 41, 47, 68, 71, 75, 200.

[103] Pye, p. 20.

[104] See Gene Wise, "Some Elementary Axioms for an American Culture Studies," *Prospects*, 4 (Winter 1978), pp. 517-547.

[105] Les Humphreys, *Interdisciplinarity: A Selected Bibliography for Users*, p. 3. Available as ERIC document ED 115 536.

[106] Sir Julian Huxley, "Science and Synthesis," *Science and Synthesis*, (New York: Springer-Verlag, 1967), p. 32.

[107] B. M. Kedrov, "Integration and Differentiation in the Modern Sciences, General Evolution of Scientific Knowledge," *Science and Synthesis*, p. 72.

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DIALOGUE WITH AUTOBIOGRAPHY:
INTEGRATING THROUGH THE STUDY OF PERSONALITY

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The growth of disciplines that offer knowledge of the human personality in the past century is startling when one measures that interest against previous centuries. Perhaps it is an expression of an emerging consciousness in our civilization that to be human requires a critical dimension of self-understanding previously absent as a norm. The fields that study personality range from areas of the natural sciences, through the social sciences, and, of course, the humanities. The experimental psychology of the nineteenth century, which focused on physiology, chemistry, and physics in approaching personality, still exists in the work of behaviorists. New knowledge in biochemistry continues the nineteenth century aspiration to explain temperament and mental health through the organic functioning of the human system. Medical psychiatry draws upon these traditional natural scientific methods, but since Freud has included as a dominant focus the study of personality. Personality is seen as a spiritual presence that cannot be simply reduced to physical causes. Human intention must be considered in its meaning. Freud's accomplishment in dignifying the complex individuality of personality accompanied and reinforced movements in other fields as the twentieth century began. Georg Simmel, one of the founders of sociology, Wilhelm Dilthey in history, Picasso in the fine arts, as well as the many Expressionists, and Ernst Mach in physics, all emphasized the fundamental moment of the human personality in giving shape to one's world.

Each field that treated personality, however, had roots in a paradigm of specialized inquiry that set limits on its realm of evidence and explanation. Though individual thinkers of genius always drew from fields beyond their specialization in considering personality, ultimately their hypotheses and research had to integrate themselves to the accepted region of their discipline. Certainly such limitation enables careful and thorough studies in the dimensions treated by the field: the psychiatrist concentrates on the psychodynamics of mental life, the sociologist explores the interactive conditions in which personality develops, the philosopher develops a logic of identity, the historian presents a new view of historical events from the standpoint of a search for identity, and so forth. For the strong, mature intellect, such as a Freud or Dilthey, working in one's own field need not prevent an integrative approach to acquiring knowledge; but for the average student of personality, the tension between the demands of one's major discipline, and the wealth of information on personality produced by a score of other disciplines and subdisciplines overwhelms integration. One finds himself in the position of the person in the Hasidic tale who labels each piece of clothes he takes off at night so that he knows where it belongs on him in the morning. He awakes and sees his shirt, labelled "shirt that goes on upper body," his pants, labelled "pants that go on legs." Finally dressed he looks around in bewilderment, "but I--where am I?" We have many separate pieces of information about personality from diverse fields, but how can we integrate this knowledge into a coherent meaning for ourselves?

An integrative opportunity is necessary in our education so that we can secure a coherent perspective that includes the many dimensions of fact concerning personality. The study of autobiography can be such a focus. As personality became a problem and guiding thread at the beginning of the century for researchers in the natural sciences, social sciences, and humanities, Wilhelm Dilthey proposed that the study of the individual and his expression in literature, art, and letters, as well as in his behavior, could provide the human proportion and crucible in which the complex knowledge of the disciplines found a synthesis.[1] Autobiography was encompassed in Dilthey's view that one could only comprehend the human being by seeing him as a single individual, and relating to him as a person. The student of personality could pose questions to the historical individual in an imaginative dialogue that enabled him to gradually understand the motives, values, and life questions of that person. One could in the formulation of questions bring to the imaginative dialogue the constructs of the social sciences, natural sciences, and humanities for the incisiveness of the question could expose facts and emphases in the historical life that not even the autobiographer fully comprehended.[2] But the questions must be shaped so that if that person were alive, he might respond. One might call the questions "client-centered" in the sense that as a questioning cultural analyst, one must draw upon the statements of the person as fully as possible in inferring meanings that go beyond the person's own comprehension; moreover, the spirit of the questioning is like a helpful associate who could, if time and distance were bridged, share his insights.[3] Of course, the researcher, in Dilthey's view, also studied the objective elements of the social context in which the historical individual lived in order to be able to measure the evidence of the person against his conditions and possibilities.[4] The dialogue with the historical individual had a value for self-understanding as well. As the questioner formulated the thoughts he would address to the historical individual, he was impelled to measure himself in the light of those thoughts. Through the dialectic with the autobiographical character (Dilthey included the great characters of fiction as accessible to the imaginative dialogue), the questioner fashions analogies which link his world to the world of the historical person in some dimension.

Is there a complete identity possible between the questioner of the present and the historical person? Can there be perfect understanding? To what degree can one learn about his own life and circumstances by attending the thoughts and actions of another individual who is removed in time and environment? Dilthey believed that each historical period had its own ethos, its own world view that separated it from the contemporary questioner, but he did feel that the sameness of human beings, and the common nature of cultural and environmental variables made the "probability" of an understanding of and approximate identity with historical persons possible. Dilthey referred to this approximate knowledge as the discovery of a "resemblance" between oneself and the historical individual.[5] Dilthey was also interested in a more substantial knowledge of the psychological laws that gave rise to personality; he thought it possible to develop a psychology from the contemplation of one's own "lived experience" and analogical inference to past persons, that might explain human behavior in every age.[6] His foundation for a descriptive and explanatory psychology has been cited as a stimulation for the Phenomenology of Edmund Husserl.[7] Thus, Dilthey has in his concentration upon the life of the individual in history provided a focus that is seminal for both the "relativist" of culture who sees the possibility of knowledge, and the "absolutist" who sees causal certainty of historical behavior as an eventual outcome of the sciences and humanities. One of the "relativists," Max Weber, a pioneer of modern sociology, developed a heuristic in interpreting social history that was influenced by Dilthey's notion of concentration upon the "lived experience" of the historical person that could be discovered in an approximate manner through a thoughtful dialogue in imagination. Through that dialogue "models" of the person and his time were constructed by the isolation of "ideal-typical" responses of that person and his community to the challenges of their lives.[8] The ideal types of behavior might span generations, but the characteristic model in which they occurred in one historical time and place enabled the investigator to see how and to what degree the persons of that period were the same or different than himself. Weber's *The Protestant Ethic and the Spirit of Capitalism* is one such study.[9] One of the "absolutists" influenced by Dilthey is Hans Gadamer, a major existential philosopher of the contemporary age. Gadamer holds that a clear and thoughtful statement from a past or foreign culture can with interpretation based on knowledge of the objective elements of the cultural context become an essential part of our own present identity. One can bridge the distance that separates historical persons to such a degree that the spirit of the past person can become a voice of the questioner's own spirit. The dialogue makes this complete identity a reality, for one is in touch with a human spirit whose essential sameness is heard and felt directly, not inferred. Moreover, the objective elements of our own culture have implicit and explicit relations to most past cultures, thus our spirit is not as divorced in its cultural context from other times as Dilthey surmises.[10]

Dilthey's inheritors become even more vocal as contemporary thinkers in all fields realize that stereotypes of the historical past or the present can only be overcome by a more proximate approach to the "lived experience" of the historical subject. Dilthey's integrated study of personality, which combined history, philosophy, psychology, sociology, and literature, all leavened in the concentration upon the historical individual, is suspect by even many of these followers. Academicians prefer to interpret personality within the vocabulary of their field. The weakness of such specialization is that it ignores the multi-faceted reality of personality. Thus, even Max Weber, as broad as was his knowledge and approach to individuals in history, neglected the psychological dimension of human motivation.[11] A modern commentator on the historical individual from the field of literary criticism, Robert Jauss, furthers Dilthey's notion of the dialogue in developing a theory of aesthetic reception, but one feels the lack of any epistemological or psychological foundation in his writings.[12] One must learn to respect the fact of the existence of differing disciplines in the study of personality which encompass the various dimensions of a human life, from its organic to its linguistic bases. Perhaps only an integrated education that considers human life in the proportion of a "lived experience," an education that commences in the elementary years, and reinforces its perspective in a spiral repetition of issues over the years of the individual's maturation, can achieve the breadth of horizon required to adapt new knowledge of personality from an adequate range of fields in a holistic approach to understanding self and others.

I would like to describe a course that uses autobiography as an integrating means at the college level. If the study of personality was cultivated throughout the years of primary and secondary schooling, in a manner appropriate for the age of the child, perhaps the course I will explain might be more modest in its integration of fields. But I see my role in offering the course "Identity and Society" as providing an integration and opportunity for personal reflection upon diverse areas of personality that has not yet been the experience of most students. Thus, perhaps I attempt more than one course can offer. Be that as it may, I have taught the course several years at this writing, and have found it to be of value in the immediate dialogue with the student. Whether it offers a persisting framework of integration for the individual is as yet untested.

Identity and Society--An Integrative Study of Personality

The four major disciplines that are integrated in the course are a selection that roughly comprise the social, political, mental, and spiritual-emotional dimensions of the personality--sociology, history, philosophy, and psychology. Within these disciplines are sub-fields that in themselves cross over into other disciplines. Other disciplines could be added or substituted, such as anthropology, political science, socio-biology, social psychology, religion, literary history, or any realm that deals with a dimension of personality. As I describe how I use the areas I have selected, the reader will hopefully be persuaded of the soundness of the integration.

History provides the temporal-spatial setting in which the life of the individual studied is lived. The personality develops within a social milieu that has a historical continuity of norms. Moreover these norms are not formed in a vacuum, rather in the action of events. The history of the territory or nation in which an individual lives must be included in the understanding of his personality, as it impinges on his goals, values, and attitudes. How much history should be included? Margaret Mead has an interesting measure of the breadth of history that is usually included in the identity of the individual: the generations one knows in considering the experience of one's grandparents, parents, oneself, and that of one's children and grandchildren. This span of five generations with which one identifies can be quite important in how one contemplates such ideas as progress, personal growth, achievement, and other aspects of one's "life world," that subjective sphere of experience that constitutes one's sense of historical possibility.[13] (The fact that Benjamin Franklin's grandfather was born in 1598, before the English colonized America, may be of moment in Franklin's courage to attempt another political-social structure in the American Revolution.[14]) Thus, when one constructs a course in autobiography, the events of one to two generations before the life studied should be reviewed in order to provide an objective context of events against which the subjective associations can be evaluated. One may wish to augment the brief historical introduction with selected forays into a deeper past if the person studied relies on traditional bodies of knowledge and cultural institutions of great age in his formulation of identity.

Sociology grows quite easily from the consideration of historical setting, helping one to see that setting in a differentiated manner. For example, Arnold Toynbee's challenge and response theory of history is illuminated by studying the norms of certain institutions that have developed to enable one to cope with his environment. The historian of the American frontier, Frederick Jackson Turner, studied interpersonal cooperation, offering a sociological principle to aid in comprehending the character of settlers in new American lands. Character is what one does; identity is what one knows of one's actions. A sociological perspective can capture the forms of human action in many dimensions of which the individual may or may not be cognizant. Besides the history of events that provide a background for evaluating personal judgments, the tableaus made possible by a study of the social customs and technologies of the area in which the person lives are an objective measure of his possibilities. The division of labor, political structure, forms of land ownership, means of transportation, communications systems, food supply, manner of policing the environment, defense against external danger, external relations to other communities (or societies), creative opportunity, social classes--all these considerations, and an individual's response to them, and role within them, expose the outline of his character and enable the student to judge the congruence or dissonance between the historical person's thought and action.

The constraint of a one semester course limits, of course, how much history and sociology can be taught as a background for the autobiographical statement. For the study of persons in cultures foreign to the student, only one or two lives should be the focus of a single course, with a major portion of the time being given to the objective context. The dialogue with a historical person, the impact of his thought, can open a vista upon one's place in his own social-historical setting, if the historical person's setting is thoroughly developed. Erik Erikson's study of Martin Luther or even his shorter character sketches in *Childhood and Society* provide such analogical possibility for the modern reader.[15] In structuring "Identity and Society," I have chosen a familiar culture, the United States, so that I can rely on previous knowledge of social institutions and historical events. I chose autobiographies that span 275 years, from the colonial experience of Benjamin Franklin's youth (and the heritage of his grandparents' experience of the Civil Wars in England) to the present using autobiographical statements of Studs Terkel's many interviews in *Working*. Between these two temporal poles, I have selected lives approximately every two generations so that through the autobiography studied one can begin to form a sense of the American experience." But the course is not solely intended as a study of American culture; the concentration upon how one formulates an identity within the challenge of certain historical-sociological conditions implies that in other cultures the dynamics of the person studied might be replicated. What Max Weber would call a "model" constructed of "ideal-typical" response patterns is suggested by the thought and behavior of Franklin, David Crockett, Frederick Douglass, Mark Twain, Margaret Mead, Sara Davidson, and others I have chosen for the course. The environmental challenges, and socioeconomic variables within the United States over the two hundred and more years since its colonial development have indicated four major models of identity, with Douglass being an example of a fifth model that reflects the tensions of freedom and bondage. The model Franklin typifies shows how individuals within an environment that is secure and undeveloped addresses cultural opportunity; Crockett exemplifies frontier identity; Twain's life is the manifestation of a culture where personal agency lessens in the challenge of technology and interdependence, and imagination and passive participation grow, and Mead introduces in her life the model of the present where social scientific attitudes and a desire for personal agency seek to solve the problem of a technological and social interdependence. There is not space in this essay to develop the models or to defend them; my work is pursued with the guiding thought that under certain social-historical conditions, on any continent, the unique character of each person also shares the ideal-typical response patterns of a finite number of models that our species has developed to cope with life.

Psychology lends to the construction of a model identity. In the second part of his autobiography, Benjamin Franklin outlines his experiment in behavioral self-observation. This attention to and recording of personal behavior is a therapeutic dimension of behavioral psychology.[16] It allows me to gradually introduce the subjective reality of the individual from a psychological viewpoint as I develop the sociological field of cultural opportunity in which the historical person acts. Moreover, behavioral self-observation is one of the requirements for the student in the course as he develops personal analogies with the historical individual. Franklin and Crockett are the major focus in creating the sociological vocabulary. The third person in the sequence of the course, Frederick Douglass, enables me to further intensify the psychological perspective, as his long and changing life is described by him at various stages and in several revisions of the same material.[17] The ego psychology of Abraham Maslow, in its analysis of defense and risk, as one seeks to actualize potential, fits Douglass' struggle and accomplishment well.[18] Kurt Lewin's topological psychology is also used to illustrate and augment Maslow's thinking.[19] Both these psychologies stress goal-formation, and the existential elements of decision-making, as well as the critical importance of subjective reality. Thus, a healthy counterpoint between the objective emphases of social norms and subjective understanding has been integrated into the process of identity formulation in the first third of the course. Mark Twain's *Life on the Mississippi, Part I*, (*The Cub Pilot*) allows an explication of metaphorical understanding, an essential tool in the psychological analysis of subjectivity.[20] The methodology of creating and analyzing metaphors to discover multiple intentions in the statements and acts of oneself and others is fundamental to autobiographical understanding. And it is a process that is part of many academic and technical disciplines in their study of personality. The second part of *Life on the Mississippi*, written seven years and many accolades after *Part I*, when Twain revisited the river as a journalist, allows me to introduce depth psychology, and the concept of persona.[21] The public face of Twain in 1882 is markedly different than the younger personality, as can be seen both in the literary style and approach to self-understanding. Finally, Margaret Mead's life allows a further development of depth psychology, which she refers to in her autobiography as a complement to her anthropological work.[22] Mead's life also permits a discussion of the integration of the sociological and psychological dimensions of personality as she considers the issues and applies the integration to her own life. Sara Davidson's

Loose Change and Studs Terkel's *Working* provide a rich array of contemporary life that the student uses in applying the insights drawn from the historical, sociological, and psychological dimensions of identity formulation in their own characterizations.

Philosophy provides a guiding thread in the consideration of the definition of identity as well as the formulation of identity models by logical criteria. While I have used contemporary thinkers on the philosophical aspects of identity formulation, such as D.H. Wiggins, Sydney Shoemaker, and Eli Hirsch,[23] I find that three English philosophers from the period in which personal identity first became a modern problem, Thomas Hobbes, John Locke, and David Hume, offer a clearer, and in their combination, more thorough view of the logical aspect of identity than the moderns, who, by and large, base their own thinking on these English predecessors.[24] Thomas Hobbes (1588-1679) and John Locke (1632-1704) lived through the violent and changing social conditions of the English Civil Wars, an age when individuals were compelled to become conscious of their personal beliefs, values, and place in society. David Hume (1711-1776), several generations younger than Hobbes and Locke, benefitted from the peace that was restored to English society, and in that more stable world provided the philosophy of identity with an analytic that complemented the synthetic logics of his philosophical predecessors.

Thomas Hobbes, in *Elements of Philosophy Concerning Body* (1655), discusses an ancient Greek riddle, one I pose to the students in the first session, which considers the idea of identity in objects, and which begins the philosophical analysis of human identity.[25] Hobbes said, "What if you have a wooden ship named Theseus that you repair plank by plank, nail by nail, until every part of the ship is replaced by a new part identical in material and form. Meanwhile, you have stored each item replaced in a pile behind the original ship. After replacing each part in the original ship, you reconstruct the stored parts into a second ship." The riddle: Which is the ship Theseus? Your answer will depend upon the aspect of identity you choose to structure your vision of the real ship; let us review some possibilities:

1. If you feel that the original materials themselves determine which is the real ship Theseus, the reconstructed ship would be the one.

2. If you feel that the continuity of form must determine the ship, then even though each part was replaced, the Theseus is the ship that has been repaired.

3. Both ships could be *a* Theseus if we argue by analogy to the biological processes of cloning in which new individuals are created identical in pattern, but different in substance.

There are many other ways of answering this riddle; each answer should seek to base itself on facts of some sort, and adhere to a logical argument. Hobbes' views on identity, as expressed by his riddle, centered upon naming. One should select criteria to trace when considering the continuity of personal identity, and define the concepts used thoroughly, so that one could find a demonstration of one's personality in the self-evidence of everyday experience. Here I begin with the students, for few of us have dwelled specifically upon those aspects of self which we emphasize in formulating our identity. Among the criteria I suggest are early memories, family, interests, ideas, purposes, work, influences, emotions and tastes, personal territories, values, skills, preferred everyday activities, and social labels. There are many other topics that might be selected, although one might hypothesize a finite amount of topics that are considered as significant in identifying oneself over time.[26] Any aspect chosen does function as a mechanism that sends a thread back into memory to sort into meaningful patterns past and present experience. One may use such criteria as elements in constructing a model of the historical personality as well as one's own.

The second phase of the construction of a model of identity with the guidance of philosophical principles is to structure the facts of identity in a coherent order. John Locke stressed the importance of one's consciousness of oneself in a meaningful vision that bordered on a philosophy of life, a story of oneself, or, at the minimum, a set of conscious operating principles that determined what reality was.[27] The organizing structure by which one orders the criteria of identity one has followed can be borrowed from literature, religion, psychology, sociology, and other cultural studies. One should not shy away from the humanistic or scientific structures developed as meaning systems by others; one must feel at liberty to use meaning systems judiciously, as heuristic insight. A vision of oneself should be constructed gradually; one should avoid submerging personal meaning or the integrity of a historical person in a ready-made system of interpretation. The construction of analogies between oneself and the historical person is the human proportion of insight that will safeguard the experimental use of ready-made systems. Through the application of self-constructed analogies based upon identity criteria one feels he shares with a historical person a structure that has been tested in its apparent validity over time. As Dilthey suggested, such an exercise deepens knowledge of the historical person while giving corresponding experience of self-knowledge.

The third phase of the construction of a model of identity that has depth and a sense of validity involves memory, a facet of identity formulation stressed by David Hume. Hume felt, as Sigmund Freud did later, that we are what we have experienced, and that we can enlarge our identity by discovering long forgotten incidents.[28] Hume countered Locke's limitation of personal identity to what is present in consciousness.[29] The exercises I pursue with the students to develop this third phase of model building--the discovery of new facts of self through memory--are of two kinds. One is the recall of past events which are sought by the criteria selected in the naming phase, or by other themes which occur to one. The event which contains facts recovered by the thematic search is then visualized, and the student asks questions of it that may lead to a strengthening or modification of his present organization of identity. One can apply the same method to the historical person, using facts that are subordinate in his life that he may mention in passing, or that are found in other records, to reconstruct the model of identity you have found the historical person to emphasize in his conscious preferences. The exercise of memory as a vehicle to enlarge or modify identity is not therapy, yet the gradual and logical experience of working on the facets of one's identity can help one develop a strong, yet flexible ego, thus potentially supporting and facilitating therapy. If the maladjustments and distortions that come from the minor and major trauma of experience are to be discovered and healed, one must have an ego that can participate in the discovery and integrate new information into an adequate sense of present identity. The exercise of memory discovery allows for a glancing off of areas in which a therapist must be present as a guide. Autobiographical memory discovery is equivalent to the exercises in self-analysis followed by Freud in the writing of the *Interpretation of Dreams*; his insight was self-revealing, but it found limits that only an analyst working with Freud could have gone beyond.[30] If the person in self-analysis gets too close to painful material, a repression, a sublimation, or other defenses, will naturally occur.

A second type of exercise used to gather more information about oneself than normally would be seen, that uses memory as a vehicle of discovery, is to view oneself as a third person in past activities. In this exercise, the student writes about how "he" or "she" performed a certain act. This sharp, objective view, which is solidly behavioral, and excludes motivation, provides data which in their empirical fullness (in a phenomenological sense) can be the bases for an inferential process that lends new meanings for the event reviewed. Variations of this third person approach have been used by Allen L. Edwards in his personality inventory, and by the German expressionist writer, Franz Kafka, in his series of reflection entitled "He."[31] Both Edwards and Kafka help one to perceive oneself in an initially harsh, yet greatly informative light.

The integration of history, sociology, psychology, and philosophy in "Identity and Society" provides a tool for the cultural understanding of others as well as for oneself. The use of autobiography provides a human proportion to the application of constructs from the arts and the sciences. The formulation of questions addressed to a person in history allows generalized knowledge to find its validity in a specific life. The student is able to develop articulate analogies between himself and the historical person because of the human proportion of the study. The student may become adept at identifying facts of his own proclivities and other criteria of identity as he practices this insight on the historical individual. Thus, a dialogue with autobiography as a crucible in which the diverse fields of the arts and sciences can be integrated *enforces* Socrates' admonition to the Sophists that the end of knowledge is not a system of thought, it is practice in life.

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FOOTNOTES

[1] Wilhelm Dilthey, *Descriptive Psychology and Historical Understanding*, translated by R. M. Zaner and K. L. Keiges. (The Hague, 1977), pp. 121-144; see also, *Die Geistige Welt, Einleitung in die Philosophie des Lebens, Erste Haelfte, Abhandlungen zur Grundlegung der Geisteswissenschaften, 2. Auflage, Wilhelm Dilthey Gesammelte Schriften*, V. (Stuttgart: Band, 1957), pp. 241-316.

[2] See a discussion of guiding disciplinary boundaries and forms of concern that can suggest the direction of question formulation for history, anthropology, and sociology in Louis Gottschalk, Clyde Kluckhohn, and Robert Angell, "The Use of Personal Documents in History, Anthropology, and Sociology," *Social Science Research Council Bulletin*, No. 53. (New York, 1947), especially pp. 32-47 for History, pp. 133-155 for Anthropology, and pp. 180-184, 219 for Sociology. Gordon W. Allport, "The Use of Personal Documents in Psychological Science," *Social Science Research Council Bulletin*, No. 49. (New York: N.D.), pp. 37-52, 67-75, and 76-86 is of special interest in considering dialogue construction from the point of view of Psychology.

[3] Carl Rogers' "clientcentered therapy" is an excellent contemporary guide for the spirit of the dialogue Dilthey suggests. One must use the language of the historical person as an entry and boundary for one's own questions and interpretations. See Carl Rogers, *Counseling and Psychotherapy*. (Boston: Houghton Mifflin Company, 1972); see also Allport, "The Use of Personal Documents in Psychological Science," pp. 53-66 for a similar approach to the words of personal documents in his discussion of the preferred "idiographic" approach to interpretation, rather than the "nomothetic."

[4] Wilhelm Dilthey, *Descriptive Psychology and Historical Understanding*, p. 131.

[5] Wilhelm Dilthey, *Die Geistige Welt*, pp. 276-277.

[6] Wilhelm Dilthey, *Descriptive Psychology and Historical Understanding*, pp. 51-120.

[7] Hans-Georg Gadamer, *Truth and Method*. (New York: 1975), p. 217. Gadamer points out that the influence was reciprocal. Edmund Husserl sought the construction of an absolute knowledge of the logical laws of knowing, as well as an application of those laws in research which would bring certain knowledge of the phenomena studied.

[8] See Thomas Burger, *Max Weber's Theory of Concept Formation, History, Laws, and Ideal Types.* (North Carolina: Durham, 1976), pp. 102-179.

[9] Max Weber, *The Protestant Ethic and the Spirit of Capitalism*, translated by Talcott Parsons. (New York: Charles Scribner's Sons, 1958).

[10] Hans-Georg Gadamer, *Truth and Method*, pp. 258-274.

[11] Max Weber, "Ueber einige Kategorien der verstehenden Soziologie (1913)," *Gesammelte Aufsaetze zur Wissenschaftslehre*, 2.. (Tuebingen: Auflage, 1951), pp. 432-438. Weber restricts his analysis of psychological content to the conscious realm of teleological judgments. He rejected any need to find a causal level of behavior in the laws of consciousness; see Weber, "Knies und das Irrationalitaetsproblem," *Gesammelte Aufsaetze zur Wissenschaftslehre*, p. 86, footnotes 1 and 2.

[12] Hans R. Jauss, *Toward an Aesthetic of Reception*, translated by Timothy Bahti. (Minneapolis: University of Minnesota, 1982).

[13] See a discussion of Edmund Husserl's concept of "life world" as a horizon of subjective possibility in Gadamer, *Truth and Method*, pp. 328-330, and his discussion of "historical horizon," pp. 269-274.

[14] Benjamin Franklin wrote the first part of his autobiography, in which his genealogy is emphasized, in 1771 while in England as an agent of the Pennsylvania assembly. The possibility of a war of rebellion was contemplated by colonial leaders at that time. Franklin's first autobiographical exercise helped him to create a "life world" with a horizon of possibility that might include new beginnings.

[15] See Erik H. Erikson, *Young Man Luther.* (New York: Norton, 1962) and *Childhood and Society*, Second Edition. (New York: Norton, 1963).

[16] See Carl E. Thoresen and Michael J. Mahoney, *Behavioral Self-Control*, (New York, 1974), p. 41, where the authors credit Franklin as one of the first persons to use behavioral self-observation. Thoresen and Mahoney present in their text a very current review of social scientific research in behavioral modification.

[17] See the Introduction and Annotated Bibliography in *Life and Times of Frederick Douglass.* (New York: 1962), pp. 15-24, 623-625.

[18] See Abraham Maslow, *Toward a Psychology of Being.* (New York: Litton Educational Publishing, Inc., 1968).

[19] See Kurt Lewin, *Principles of Topological Psychology*, translated by Fritz Heider. (New York: McGrawHill, 1936).

[20] Mark Twain, *Life on the Mississippi*, (New York, 1961), pp. 37-92.

[21] See Carl Gustav Jung, "The Relations Between the Ego and the Unconscious," *The Basic Writings of C. G. Jung*, edited with an Introduction by Violet Staub de Laszlo. (New York: 1959), pp. 136-142.

[22] Margaret Mead, *Blackberry Winter, My Earlier Years*. (New York: Morrow, 1972), pp. 238-239.

[23] See the essays in *The Identities of Persons*, edited by Amelie Oksenberg Rorty. (Berkeley: University of California Press, 1976) and Eli Hirsch, *The Concept of Identity*. (New York: Oxford University Press, 1982).

[24] See especially David Wiggins, "Locke, Butler and the Stream of Consciousness: And Men as a Natural Kind," in *Identities of Persons*, pp. 139-174.

[25] Thomas Hobbes, "Of Identity and Difference," *Elements of Philosophy Concerning Body*, Part II, Ch. XI, (La Salle, Illinois, 1963) pp. 80-85.

[26] As one seeks the laws of consciousness, one may seek those ego identifiers fundamental to personality. Perhaps they are a combination of psychophysical needs that the human species requires. I suggest a finite set of topics in the spirit with which Immanuel Kant criticized Aristotle in the latter's listing of the essential categories of identifying things in experience: "It was an enterprise worthy of an acute thinker like Aristotle to make a search for these fundamental concepts. But as he did so on no principle, he merely picked them up as they came his way."; see Kant, *Critique of Pure Reason*, translated by Norman Kemp Smith. (New York, 1968) (B107), p. 114.

[27] John Locke, "Of Identity and Diversity," *Essay Concerning Human Understanding*, (La Salle, 1962), Book II, Chapter XXVII, Sections 23-25, pp. 259-262.

[28] David Hume, "Of Personal Identity," *A Treatise of Human Nature*. (New York, 1974), Book I, Part IV, Section VI, pp. 247-248.

[29] Locke's view has consciousness producing personal identity by its selection of facts, whereas Hume stresses the discovery of identity by recovery of all of what has occurred to one. See Locke, "Of Identity and Diversity," *Essay Concerning Human Understanding*, Sections 23, 24, pp. 259-261; see Hume, "Of Personal Identity," *Treatise of Human Nature*, Section VI, p. 248.

[30] Freud points out the impossibility of finding the essence of one's problem through self-analysis in his *New Introductory Lectures on Psycho-Analysis* (1933), translated by James Strachey, (London, 1964), Lecture XXIX, pp. 13-14. Freud's self-analysis in *Interpretation of Dreams* is then at the surface level of insight that enables one to identify manifest concerns; see *Interpretation of Dreams*, (1900), translated by James Strachey, (London, 1953), Chapter II, pp. 106-121.

[31] See Allen L. Edwards, *Edwards Personality Inventory*, (Chicago: Science Research Associates, 1964), and Franz Kafka, "He," in *The Great Wall of China. Stories and Reflections*, translated by Willa and Edwin Muir. (New York: Schocken Books, 1975), pp. 153-161.

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A QUALITATIVE MODEL OF THE INTEGRATIVE LEARNING PROCESS

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The liberal arts undergraduate, through the process of post-secondary education, has become increasingly differentiated and specialized. His or her knowledge base has been increased through an incremental process in which the units of delivery are organized into discrete units called "courses," "minors," and "majors." For many these units appear to remain discrete, disconnected elements. The major program is usually designed with a particular constellation of courses intended to deepen one's knowledge within a discipline by piling one unit of learning upon another. In other words, this process is characterized by the acquisition of knowledge within a discipline rather than the attainment of understanding both within and, more especially, across disciplines (transdisciplinarity). Russell Ackoff[1] refers to the former, knowledge acquisition, as an example of a "growth" process, while the attainment of a greater degree of wholistic understanding would be characteristic of "development."

There are, of course, notable exceptions to these generalizations about post-secondary education. The great books approach pioneered at the University of Chicago and implemented at St. John's College, Annapolis, Maryland, at which there are no majors, is one example of an attempt at an integrative liberal arts education. The uniqueness of this approach is, however, suggested by the fact that St. John's requires all matriculants to begin as freshmen and will not award credit for courses taken at other colleges.

A second example of an attempt at integrative education at the undergraduate level is provided by institutions which offer an interdisciplinary studies focus spanning the full four years of college. Western College at Miami University, Oxford, Ohio, exemplifies this approach. Again, that this approach is not widely accepted is suggested by the fact that less than 3% of Miami's undergraduates are enrolled at Western.

A third increasingly popular way of responding to students' expressed interests in applying classroom knowledge is reflected in the recent increase in directed field studies, internships, or experiential programs available to liberal arts students. Based on the model established for pre-professional training in health-care, psychology and social work, field study programs attempt to integrate academic knowledge through "real world" experience off campus. Whether or not these programs are effective as integrative mechanisms and the generalizability of this approach to other disciplines is a subject of considerable debate on campus. A second question that is frequently raised is "whether or not the 'integration of learning' is the proper venue of the college and university?" In doing so, integration is often contrasted to the "acquisition of knowledge," about which there seems to be less concern as an appropriate goal of higher education.

In the following discussion, it is my assumption that the development of a capacity to integrate knowledge and thereby attain understanding is a legitimate goal of higher education, although it is, admittedly, more difficult to measure its achievement than it is for a goal of knowledge acquisition. This assumption allows me to proceed to address the first question--the effectiveness of experiential programs for integrative learning.

This discussion is clearly in the nature of a "thought experiment," rather than an empirical analysis. This approach is, I believe, warranted by the subject matter of the investigation. The outcome, therefore, will represent a qualitative model of the integrative learning process, rather than a quantitative one--that is, it purports to describe how integrative learning occurs rather than to predict what or how much will be learned.

The attributes by which to develop a generic description of the integrative learning process are derived from a review of the literature of General Systems Thinking (GST), particularly in regard to its descriptive applications of interactions within social systems.[2] The appropriateness of this use of GST rests on its acceptance as a methodology for morphological analysis--the study of the form and structure of systems; in this case, a social learning system.

The second and third columns in Table I represent two different models of learning: (a) "Growth," characterized by knowledge acquisition, elements of knowledge; and (b) "Development," associated with insight and the attainment of understanding of the relationships between elements.

Table I: Attributes of the Learning Processes

	GROWTH	DEVELOPMENT
Goal	Knowledge acquisition	Attaining Understanding
Process	Differentiation and Specialization	Integration
Arena	Physical	Meta-Physical
Elements	Facts, sense	Intuition, non-sense
Outcomes	Growth	Development
Philosophical Bases	Empiricism, Logical Positivism	Phenomenology, Humanism
Orientation	Individualistic	Wholistic
Source of Authority	External	Internal
Strategy	Vicarious experience	Direct experience

The terms in the right-most column in Table I are, thus, the descriptors of a "developmental" learning process. Given this description, the next question to be answered is "Are there any programs of which you are aware to which this description applies in whole or in part?"

To me, the answer to this question that seems most obvious is "programs whose professed purpose is the attainment of a wholistic world view." Such programs are frequently concerned with the development of a monistic cosmology. By necessity, they attempt to deal with teleological and ontological issues. This suggestion may lead to some discomfort on the reader's part, which I hope will be resolved shortly. I do not intend to pursue the teleological or ontological issues beyond this brief acknowledgement of their importance. Instead, I intend to focus more narrowly on methodological issues and leave resolution of the philosophical issues associated with the application of the methodology to each prospective user.

In attempting to restrict this discussion to pragmatic issues, it seems useful to develop a working definition of what constitutes development"--the attainment of understanding. With such a definition, it is possible to develop an evaluation schema for programs which purport to be "developmental"--i.e. to answer the question, "to what extent did the program contribute to the attainment of wholistic understanding?"

Lewis Beck's translation of Immanuel Kant's essay "What Is Enlightenment?" offers a useful answer, if we equate the attainment of understanding with an "enlightened" viewpoint:

> Enlightenment is man's release from his self-incurred tutelage. Tutelage is man's inability to make use of his understanding without direction from another.[3]

This definition is also remarkable for its similarity to Russell Ackoff's description of the effective problem solver who has developed the ability to transcend "self-imposed constraints."[4] If these notions are accepted as characterizing success in "development," the reader can readily see that there are a considerable number of existing constructs which could be used as indicators of attainment.

Personality and self-concept theory provide a rich source of possibilities. Various standardized measures of independence, ego strength, internal v. external directedness, and introversion v. extroversion are readily available in such forms as the Personal Orientation Inventory,[5] The Adjective Check List,[6] and the Strong-Campbell Interest Inventory.[7] Readers interested in pursuing this aspect more closely are referred to the literature on the affective and connotative aspects of learning.[8]

There are, in my experience, at least two generic classes of programs which share the idealized goal of attaining a wholistic world view and which can be described by the terms in the right-hand column of Table I: (1) Humanistic psychotherapeutic modalities; and (2) monistic religions. The former set includes, for example, Gestalt Therapy, Carl Roger's Client Centered Therapy, Abraham Maslow's approach to self-actualization, or certain so-called transpersonal approaches. Zen Buddhism is a prominent example of the latter group.

When these examples are examined more carefully, based on my understanding of the theories and their application in practice, the Gestalt and Client Centered approaches both appear to be consistent with the descriptors in the development column, except for "Arena: Meta-physical" and even this is an arguable exception. Zen Buddhism is wholly consistent, including enactment within a meta-physical arena.

Although unfamiliar to most Westerners, Mahayana Buddhism, of which Zen practice is a form, is being advanced for its novelty, consistency, and utility for interpreting several areas of contemporary Western thought; for example, Quantum Physics, Process Philosophy, psychotherapy, and general systems thinking.[9] The elements which appear in discussions of Zen practice, in contrast to Zen which is not something discussed,

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provide many excellent examples of specific programmatic elements for study by designers of integrative educational activities.

By looking at the Gestalt and Client Centered approaches, both of which have been extensively documented, we should by inference be able to develop a list of common characteristics useful in creating a model of wholistic developmental processes. Four possibilities are suggested. They are:

(1) Both are based on Humanism, as a philosophy, rather than Behaviorism.

(2) Both recognize the importance of a group process to each member's individual experience and progress toward his or her developmental goals.

(3) Both depend upon the development of an authentic relationship between the learner (client) and the facilitator (therapist).

(4) In both, frustration accompanied by anxiety at a level sufficiently high to be perceived by the learner as a "life problem" is present.

Of these four, the last probably requires the most explanation in relation to the design of an educational program. In most formal educational environments, programmatic emphasis is given to reducing the levels of frustration and anxiety, rather than increasing them. This is also the case in a psychotherapeutic setting when the client's latent or manifest anxiety levels are so high that effective interpersonal communication is blocked. It is however generally recognized that some anxiety and/or frustration is necessary and desirable for its motivational potential, as inferred from interpretation of Maslow's "hierarchy of needs" or of Atkinson's concept of "cognitive dissonance." Gerald Weinberg[10] in discussing General Systems Thinking, refers to this phenomenon as an example of the "Used Car Law" and its corollaries, to wit:

> A system that is doing a good job need not adapt.
>
> A system may adapt in order to simplify its job of regulating.
>
> A way of looking at the world that is not putting stress on an observer need not be changed.
>
> A way of looking at the world may be changed in order to reduce stress on the observer.

Formal education may be thought of as a means of attempting to teach a variety of ways of looking at and interpreting the world. "Stress" is the element, the absence of which leads to unquestioned repetition of method and the presence of which leads to adaptation--i.e. development. Indeed, all three of the methods referred to above, Gestalt, Client Centered Therapy, and Zen practice, employ specific strategies to inject stress into the learning process: confrontational techniques in Gestalt; "silence" in Rogerian practice; and the koan of Zen. Traditional educational methods also have their anxiety producers, quizzes, exams and deadlines which, as any college professor will attest, have motivational potential. There is, however, a significant difference between the anxiety evoked during a therapeutic process and the test-related anxiety of the college student. The former is intrapersonal anxiety which tends to motivate long term development. The latter is situational anxiety which motivates short term growth (i.e. to collect more data to be memorized for the test and, unfortunately, frequently forgotten shortly thereafter).

THE QUALITATIVE MODEL

Relatively recently, a class of descriptive or qualitative models known collectively as "catastrophe theory" models has been advanced by its originator, Rene Thom,[11] as characterizing certain human behaviors. In elaborating on Thom's work, E.C. Zeeman says:

> ...we may expect the elementary catastrophes to be typical models of brain activity, especially of those parts of the brain such as the limbic system....It is in the limbic system that emotions and moods are generated.... Therefore, we might expect catastrophe theory to be the mathematical language with which to describe emotion and mood....It is not unreasonable to assume that (the elementary cusp catastrophe) is not only a model of the observed behavior of aggression, but also a model of the underlying neural mechanism.[12]

From these remarks, by extrapolation, a reasonable inference is that the elementary cusp catastrophe appears as a likely candidate for modelling the integrative learning process. Rather than aggression, as cited above, manifest anxiety or frustration is the emotion, and we are seeking the underlying neural mechanisms associated with anxiety and learning behaviors.

As a class, catastrophe models are used to describe situations in which one or more of the controlled variables is associated with a discontinuous change in an endogenous (dependent) variable. The success of qualitative modelling, which is descriptive rather than predictive, depends on the ability:

> ...to choose coordinates in such a way that the kinds of discontinuity that occur are one of a standard list of seven elementary catastrophes.[13]

In this instance, it is our desire to model "learning" as a discontinuous developmental process.

For ease of interpretation and graphic representation, a three dimensional learning model in which there is one endogenous variable, L (learning) and two controlled variables, T and P (time and program) is proposed. As a working hypothesis, it does not seem unreasonable to postulate that learning (L) is a function of the amount of time (T) that the learner is involved, the planned program (P), and the learner's initial attitude toward learning or mind set (S). Thus:

$$L = f(T,P,S)$$

Both P and S are understood to represent complex sets of variables, while T may be interpreted as either objective (clock) time, t_o, or subjective (perceived) time, t_s. A model which attempted to deal with the inter-relationships between the associated variables, assuming we could identify them, would be extremely complex. Fortunately, we do not have to deal with each and every variable in order to obtain a usable interpretation, since we are not trying to predict how much would be learned, but to develop some insights into how learning may occur.

A further simplifying assumption is that at the macro-system level, the variables P and S are independent. This is tantamount to suggesting that a learning process can be designed without regard to the mind set of the learner for whom the program is being designed. In practice, this is often the case for higher education. Despite admissions criteria intended to screen out or attract right-minded students, research on the prediction of academic success has been able to identify relationships between variables by which to explain less than 30% of the variance in prediction vs. actual performance.

These assumptions allow the model of the learning process to be expressed as two functions which may be dealt with independently:

$$(1) \quad L = g(T,P)$$

$$(2) \quad L = h(T,S)$$

The former is, for our purposes here, the more interesting because both T and P are controllable from the point of view of the program designer; whereas, S rather clearly is not. Equation (1) may also be looked at as two equations:

$$(1a) \quad L = j(t_o,P)$$

$$(1b) \quad L = k(t_s, P)$$

The interpretation of the model varies somewhat based on whether we see "time" as an objective phenomenon or a subjective one, as we shall see shortly.

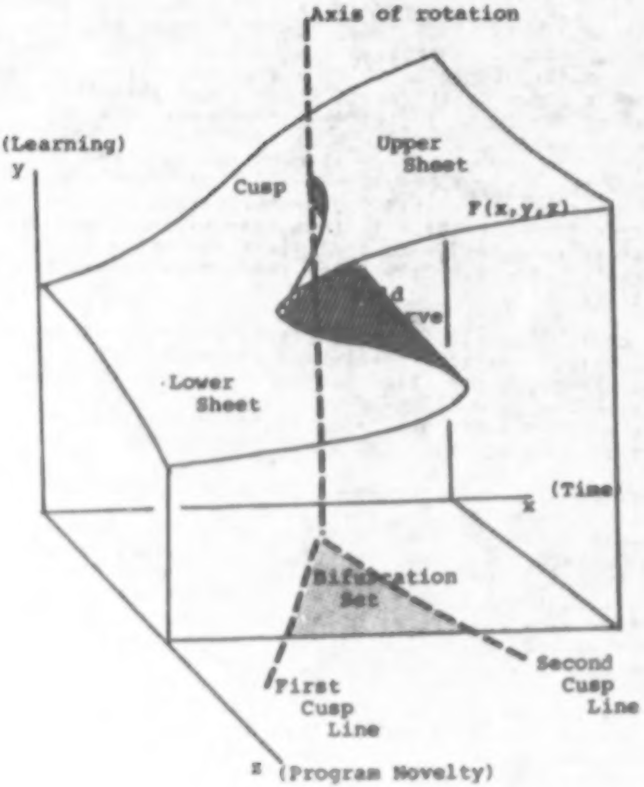
With one endogenous and two controlled variables, the relationships may be modelled using the three dimensional cusp catastrophe model, the general form of which is depicted in Figure 1. The graphic form of the cusp catastrophe in three dimensions is a folded plane surface, the fold of which does not extend through the full width of the plane, but terminates on its surface as a wrinkle or "cusp." The upper and lower sheets of the plane on either side of the fold area represent most likely behavior while the middle sheet, shaded in Figure 1, generally represents least likely behavior.

> The curve on the surface where the upper and lower sheets fold over into the middle sheet is called the fold-curve, and the projection of this down into the horizontal plane C is called the bifurcation set. Although the fold-curve is a smooth curve, the bifurcation set has a sharp point, forming a cusp, and this is the reason for the name cusp-catastrophe. The cusp lines form the main thresholds for sudden behavior change....[14]

A further property of this model is that the orientation of the model, hence its interpretation, may be changed by rotating it around a line perpendicular to the horizontal plane C which passes through the cusp. In this instance, we will begin our modelling process with the model oriented so that a line perpendicular to the x-axis bisects the bifurcation set. Under this condition, with the two control variables, T and P, measured on the x and z axes, the variable on the x-axis is called the normal factor and the variable on the z-axis is called the splitting factor. As the model is rotated away from this position around the vertical through the cusp, the factors are interpreted as conflicting factors. Both orientations are relevant to our discussion; however, we shall begin with the non-conflict state.

The appropriateness of this model is based on how well the model describes the process under consideration. Zeeman suggests[15] that the model is appropriate in situations exhibiting five qualitative features: (1) bimodality, (2) inaccessibility, (3) sudden jumps, (4) hysteresis, and (5) divergence. Education is, according to Zeeman, one such situation.[16] Rather than demonstrating its appropriateness, a priori, I will let the justification of this specific application grow out of the interpretation by reference to the five features listed above.

Figure 1: The Cusp Catastrophe Model


Axis of rotation
(Learning)
y
Cusp
Upper
Sheet
F(x,y,z)
d
rve
Lower
Sheet
(Time)
x
Bifurcation
Set
First
Cusp
Line
Second
Cusp
Line
z (Program Novelty)

(Zeeman, E. C. *Catastrophe Theory: Selected Papers, 1972-1977.* Reading, MA: Addison-Wesley, 1977)

INTERPRETATION

To apply this model to the learning process, it is first necessary to label the axes. Using the variables from equation 1, the factor associated with the x-axis will henceforth be time (T); that with the y-axis, learning (L); and finally the z-axis will be used as a measure of program (P); specifically, program novelty defined as the degree to which a program design deviates from the learner's prior experience. Projections into the back plane A bounded by the x and y axes thus represent learning over time (i.e. a learning curve). A vertical section of the model parallel to the y-z plane through the cusp and fold-curve would show the *divergence* of the upper and lower sheets. For any given value of x, in this case representing a point in time, the further the value of P is from the origin, the higher the upper sheet is in relation to the y-axis measuring learning, L, and, conversely, the lower the lower sheet is with respect to the value of L.

The loci of the intersections of planes parallel to the x-y plane with the folded surface represent individual "lines-of-experience" within the state space bounded by the x, y, and z axes. I am using the term "line-of-behavior" to indicate that we are dealing with an individual's perception of the learning experience rather than an empirical study of learning behaviors.

Two different lines-of-experience are shown in Figure 2. Line #1 characterizes a learning process which results in a continuous smooth ogive for the learning curve, Figure 2a. Line #2 is located further out along the program axis away from the origin, such that it intersects the fold-curve. When projected onto the x-y plane, the learning curve associated with Line #2 may appear either as a continuous or discontinuous curve. That is, if time is treated as an objective phenomenon, t_o, in the area represented by the fold-curve and its projected bifurcation set, line #2 must either (a) pass around the cusp to the left (rearward), (b) exhibit an instantaneous change of state, a discontinuity, as the locus shifts from the lower sheet to the upper sheet, or (c) turn right (toward the reader). When time is interpreted as a subjective phenomenon, t_s, two additional alternatives are available: (d) *hysteresis* or cyclical behavior and (e) regression. These latter two alternatives will be discussed more fully later.

"Program" is, thus, the splitting factor that locates the l-o-e with respect to the cusp, establishing the *bi-modality* of learning; "growth," represented by line #1, versus "development," indicated by line #2. The learning curve associated with the discontinuous state is graphed in Figure 2b. It is my contention that this is the curve descriptive of the attainment of understanding, represented in the model by the *sudden jump* of the learning curve in the region of the fold-curve--insight based on prior knowledge acquisition, the "aha" phenomenon.

Figure 2: Continuous and Discontinuous Learning

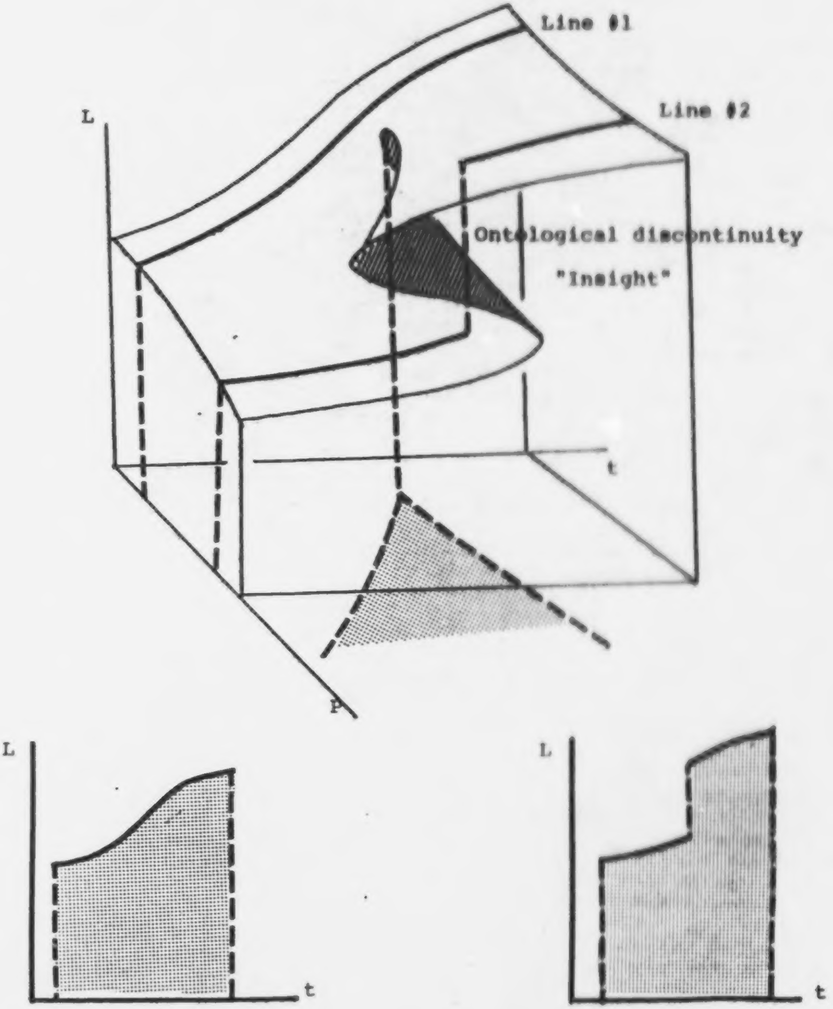

Line #1
Line #2
L
Ontological discontinuity
"Insight"
t
P
L
t
L
t

Fig. 2a: Line #1 Learning Curve

Fig. 2b: Line #2 Learning Curve

(Zeeman, E. C. *Catastrophe Theory: Selected Papers, 1972-1977*. Reading, MA: Addison-Wesley, 1977)

Demonstrable learning has occurred and time prior to and after the experience are measurable, but the time it took for experience of insight is not measurable (i.e. phenomenally it is experienced as instantaneous).

This experience is characteristic of synergistic developmental processes in which the cumulative learning is greater than that which can be attributed directly to a simple aggregation of elements. The arrangement of the elements and the relationships between the elements are also experienced by the learner as being significant, i.e. "the whole is more than the sum of the parts." With the passage of time, t_0, Line #2 moves monotonically from left to right and upward in the area to the left of the fold-curve indicating that learning is occurring. Line #2 is both lower and flatter than Line #1 in this region suggesting the learning is less rapid (i.e. $dL_2/dt_0 < dL_1/dt_0$). Eventually, Line #2 reaches the region of the fold-curve, as indicated by the first cusp line of the bifurcation set. This is the first point in time at which the leap to the upper fold sheet, which we have suggested is characteristic of developmental learning, can be made. Similarly, the second cusp line represents the last point in time when such a jump can occur as long as time is treated as an objective phenomenon.

Before continuing with the specific interpretations of the above five alternatives available to the learner when the fold-curve is encountered, I should like to point out the overall relationship of the model to program design. Line #1, with its continuous learning curve, I am suggesting, is characteristic of a growth process in which knowledge is acquired in discrete units. The learner's experience, represented by line-of-experience #1, has no elements which create a discontinuity from past experience; there is no "ontological discontinuity." This line represents "traditional" educational practices; essentially a repetition of a familiar instructional methodology. Although the subject matter changes for each unit of delivery, the psychological and educational structure does not.

Psychologically, as the student experiences it, traditional higher education, in many cases, is very little different from his or her secondary educational experience. This is a function both of the homogenizing pre-admission process of selecting students who look like the students the institution has previously enrolled and some ontogenetic factors which may constrain the method and content of what can be taught effectively in the first 18 to 22 years of life. Kenneth Wilber[17] is one developmental theorist who suggests, for example, that the capacity of the learner for abstract speculation, what he refers to as "Vision-Logic," is dependent on the completion of certain precedent stages, akin to the stages of Piaget, Erikson, Kohlberg and others. Without debating the merits of stage theories as a whole, my interpretation of Wilber's remarks suggests that traditional education is traditional precisely because it is already doing that which is most do-able in the first 18 to 20 years of life--teaching analytic methodologies for dealing with the world as though it is composed (solely) of objective, quantifiable phenomena.

This approach, in the West, is consistent with the deterministic, dualistic Cartesian-Newtonian philosophical foundation on which it rests. Pragmatically, non-analytical approaches cannot be taught, although they may be learned. It is, therefore, useful first to develop a solid foundation of analytic method on which to base an understanding of that which is non-analytical. The problem, and not all educators would agree that it is a problem, is that traditional educational practices frequently end with the acquisition of analytical methods, leaving the learner's world in parts.

While analysis has proven to be a very effective way of taking the world apart, it is not an effective means for attaining integration of disparate parts, particularly when the original analysis was not conducted by the person who is now seeking the synthesis, as is the case in higher education. The student's "world" has been divided into pieces called "courses," "minors," and "majors" by the program designers not by the students, often not even by the current faculty. It should not be surprising, therefore, that pulling the pieces together into a coherent whole is perceived to be a difficult undertaking; so difficult, it is frequently avoided. The subsequent relationship of the parts, Gestalt formation, the formation of wholes, integration of knowledge and experience, is left to the "college of hard knocks," psychotherapists, rabbis, pastors, priests, the neighborhood bartender and other gurus of contemporary society.

The model points out that there are processes at work which may be used productively to foster developmental learning as well as knowledge acquisition. If these processes are ignored, they remain as "uncontrolled variables," as Russell Ackoff would call them.[18] Recognition makes it possible to bring them into the realm of "controllable variables." If the characteristics of the planned program, shown as P_2 on the z-axis of the model, diverge significantly from our "traditional" program P_1, the associated line-of-experience #2 is "split" from that of traditional learner. As Line #2 is moved away from the origin along the z-axis by successively more "novel" programs, so also does the horizontal distance between the cusp lines and the vertical distance between the upper and lower sheets increase due to the divergence of the fold-curve.

The distance between the cusp lines may be interpreted as the time span during which the learner is "ripe: for the attainment of understanding. The distance between the upper and lower sheets may be thought of as representing the threshold to be overcome in order to attain understanding. The greater the divergence in program design from the traditional, the greater the time span during which the leap can occur, but also the greater the threshold and, therefore, the greater the effort required.

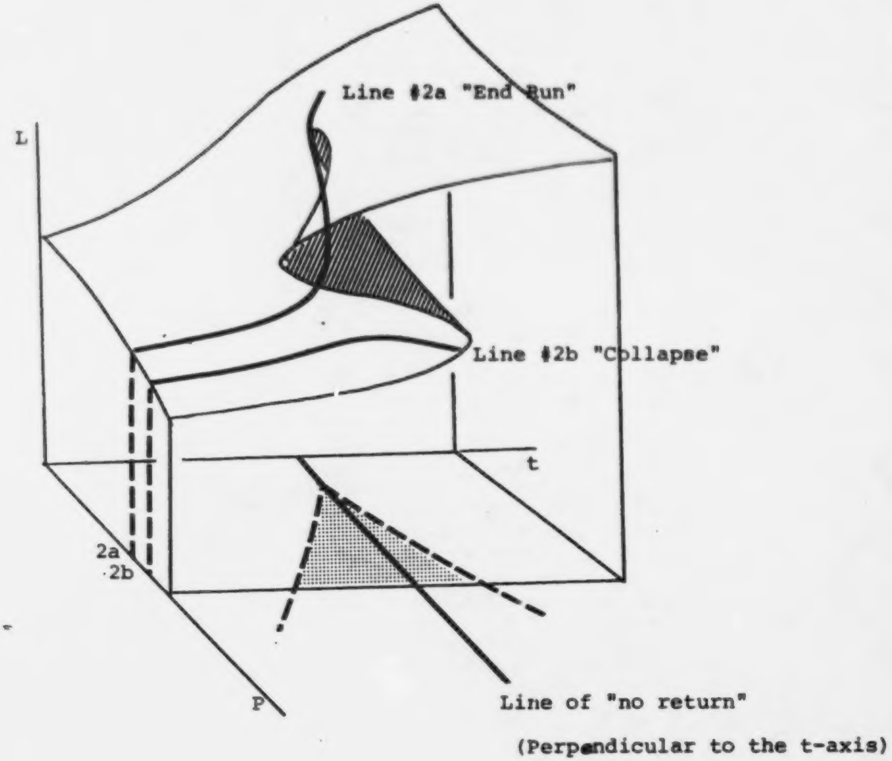
With respect to our problem of program design, the model suggests that we have two controllable variables: (1) time, and (2) program divergence or "novelty." Time, as a variable, has two aspects: (a) duration, and (b) timing of the discontinuity. With respect to the former, the planned program must be of sufficient duration for the line-of-experience to enter the fold-curve and resolution to occur. Timing refers to the placement of the discontinuity within the time frame of the program. Program diversity or novelty is important as the splitting factor which also mediates the point at which the line-of-experience enters the bifurcation set; thus the height of threshold and the time available to attain resolution.

The more a program design, in the perception of the learner, diverges from the learner's expectations and experience, the greater the threshold and the greater the degree of intrapersonal anxiety present. Previously learned "rules-of-the-game" no longer seem to apply. Energy must be devoted to learning new rules and developing new coping strategies. This is one reason, the model suggests, that measurable learning appears to be less and at a lower rate in the early stages for Line #2 than for Line #1. The discontinuity experienced when the learner perceives himself to be entering the bifurcation set results in intrapersonal anxiety which is a source of energy to make the leap to the upper sheet (i.e. to attain understanding). This constitutes a necessary condition for the attainment of understanding, but it is not always sufficient.

In addition to the attainment of understanding represented by the vertical leap, the model suggests four other possibilities. With time interpreted objectively, a line-of-experience entering the bifurcation set cannot extend beyond the second cusp line, which would require the clock to run backward. Under this constraint, two alternatives to the discontinuous leap to the upper sheet are: (1) for the line-of-experience to bend leftward toward the cusp moving forward temporally by approximately paralleling the initial cusp line until the cusp is reached and can be passed around, an "end-run" strategy; or (2) turning to the right, continuing forward in time paralleling the second cusp line. These alternatives are depicted in Figure 3 as lines #2a and 2b respectively.

Line #2a implies that the learner is taking action to reduce the discontinuity, to move toward a region of the fold-curve where the threshold is lower or non-existent through restructuring the program along more familiar lines. This can occur physically, for example, by a "drop and add" program adjustment, or psychologically through a process of rationalization. The model suggests that the "end-run" strategy is available until a "point of no return," represented in the model by a line perpendicular to the x-axis passing through the cusp, is reached. In the case presented, the locus of the "points of no return" forms a line which bisects the bifurcation set. When this line is reached, it is no longer possible for the learner's l-o-e to bend to the left in the splitting

Figure 3: "End run" Rationalization and "Collapse"


L
Line #2a "End Run"
Line #2b "Collapse"
t
2a
2b
P
Line of "no return"
(Perpendicular to the t-axis)

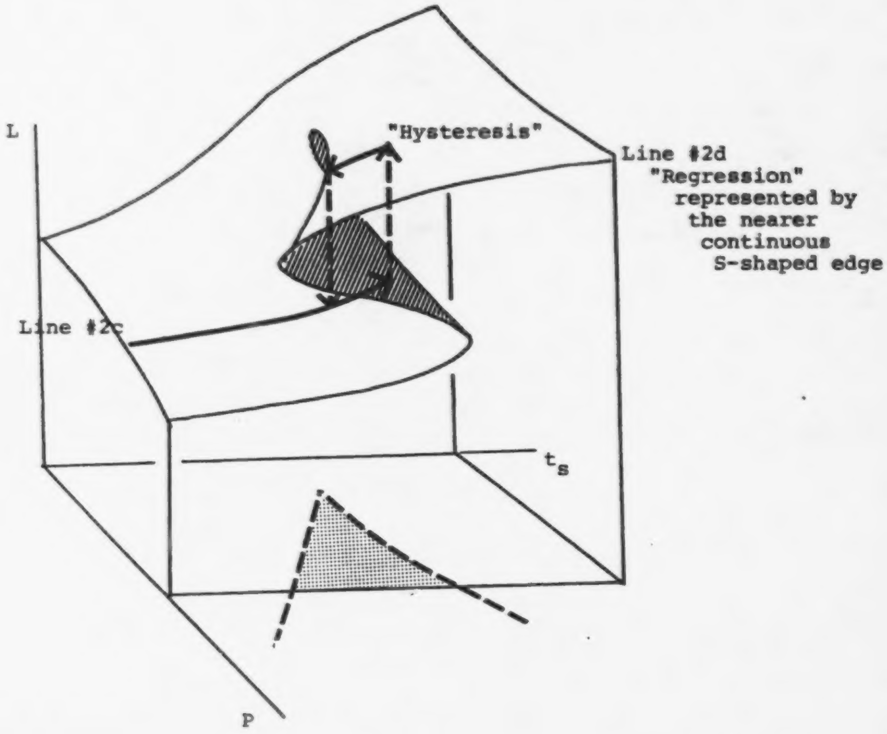
(Zeeman, E. C. *Catastrophe Theory: Selected Papers, 1972-1977*. Reading, MA: Addison-Wesley, 1977) factor-objective time interpretation. This line metaphorically represents the condition in which the learner has invested so much energy into the effort that it is no longer possible to achieve resolution through rationalization.

The projection of Line #2a onto the rear plane, representing its associated learning curve shown in Figure 3a, looks similar to the continuous learning curve of Line #1 when it passes completely around the cusp or it exhibits smaller discontinuities than Line #2 if the lower thresholds are surmounted before the cusp was reached. Starting from a lower level of learning the learning curve associated with line #2a must rise rapidly in the fold curve area and approach the levels of learning indicated for Line #1 in order for the end-run to be successful. The appearance of this relatively sharp increase in learning is deceptive; while learning is occurring, the model suggests, that it is primarily accommodative in character, rather than assimilative. After a left-turn, even when the threshold is subsequently surmounted by a sudden jump, because of divergence the model suggests that the learning will be less than had the jump been made further out from the origin. The learning associated with the experience represented by Line #2a might be characterized as rationalized "pseudo-insight;" contributing more to growth than to development.

Line #2b, in which the learner would be experiencing a greater and greater degree of intrapersonal anxiety, can be characterized as the precedent conditions of psychological "collapse." The projected learning curve, shown in Figure 3b, is similar to that proposed by Hans Selye with regard to the effects of stress on problem solving ability. Having passed the point of no return, the l-o-e tracks along the second cusp line away from the origin, deeper and deeper into the fold area. The threshold increases and learning appears to decline possibly even beyond its initial level. It is possible for the l-o-e to exhibit a sudden jump after a right turn. This would represent the attainment of a genuine insight, with or without therapeutic assistance, during a period of relatively severe psychological trauma. Such a line would, for example, be characteristic of a religious conversion experience, such as the attainment of Satori in Zen practice.

In Figure 4, the two additional alternatives associated with time interpreted subjectively are shown. The first, represented by Line #2c, shows the learner reaching the second cusp line, then continuing "backward" in time while remaining on the surface of the middle sheet of the fold-curve. This would represent "regression" as a psychological defense. The learner has restructured the temporal dimension psychologically, rather than restructuring the physical elements of the experience as is the case for the rationalized end-run. This allows the learner time to re-experience the event before assimilating the experience and attaining a new level of understanding represented by the learner's l-o-e on the upper sheet. This accords very well with the interpretations of neurotic behaviors in the

Figure 4: "Hysteresis" and "Regression"


L
"Hysteresis"
Line #2d
"Regression"
represented by
the nearer
continuous
S-shaped edge
Line #2c
t_s
P

(Zeeman, E. C. *Catastrophe Theory: Selected Papers, 1972-1977.* Reading, MA: Addison-Wesley, 1977) classical psychoanalytic model.

The second alternative, in which time is treated as subjective, seems to be a variant of the regressive experience. In this case, the line-of-experience is seen leaping to the upper sheet; however, rather than progressing forward in time, the line moves backwards dropping back to the lower sheet, a phenomenon known as "hysteresis." The learner cycles, alternately attaining insights and regressing; metaphorically, "going around in circles." This phenomenon is, perhaps, more familiar in episodes of religious conversion, than in formal education, when the threshold is so high that the learner is quite overwhelmed with the scope of his or her vision and lacks sufficient energy to continue the learning process. It is, in fact, a phenomenon explicitly warned against in certain religious practices (e.g. both Zen and Tibetan Tantric Buddhism).

Thus, the interpretation of the model suggests there are five pure strategies for describing the outcomes of the learning process when a discontinuity is experienced: (1) the sudden jump of instantaneous "insight," (2) "end-run" rationalization, (3) "collapse," (4) "hysteresis," and (5) "regression." A learner's actual experience is most likely a mixed strategy combining two or more of these alternatives. The totally self-transcendent learner for whom each discontinuity in experience contributes to immediate insight represents an ideal type rather than a real person's experience. A true Zen master, of which there are very few, is perhaps the closest documented example of such a learner.

The model, as it has been presented and briefly discussed above, does clearly demonstrate the presence of all of the five properties of catastrophe theory models. One not explicitly mentioned above is "inaccessibility." This refers to the nature of the insight experience itself, which is not interpretable (i.e. is inaccessible), since the leap representing it lacks a temporal dimension in the state-space. The appropriateness of the cusp catastrophe model for the purposes proposed herein is thus confirmed.

CONCLUSIONS

With this confirmation, we should now be able to make some inferences about the nature of the learning process on which to base the design of an integrative educational program. From the construction of the model itself, the effects and relationships of the controllable variables, program design (P) and time (T), upon learning (L) and with each other become clearer. Specifically, the significance of time duration is made manifest and its correlation to intrapersonal anxiety is highlighted. Intrapersonal anxiety, mediated by the novelty of program design, its degree of divergence from the learner's prior experience, becomes the linking factor relating time as an objective element, hence also an element of program design, with the learner's subjective experience of the program.

Since, by definition, intrapersonal anxiety is an individualized phenomenon, this argues for the need to individualize the educational process. While this may not be an attractive proposal within the economic constraints of higher education, the model points out that maximization of individualization represents an important design goal.

Intrapersonal anxiety is injected into the learning process the model suggests, through designs which are perceived by the learner as "novel" in the sense intended by Alfred North Whitehead.[19] Novelty lends appetence to the learning process, generates energy, leading to divergence, the creation of negentropy counteracting the downward trend suggested by Line #2b associated with unresolved discontinuities. This implies that program designs should depart in one or more ways from the learner's prior experience. Three possibilities are suggested for consideration:

(1) The context or environment: Removing the program physically from the surroundings with which the learner is already familiar--off-campus rather than on; urban settings for suburban students, etc.

(2) The content: Selecting a subject for study with which the student is relatively unfamiliar--this is particularly important as a levelling mechanism if instruction is going to be in a group situation where learners' prior education may vary substantially, as is characteristic of upper level liberal arts students from different institutions.

(3) The structure or style: Again, departure from past experience in leadership style, organization, choice of materials, delivery mode and other structural elements will tend to exacerbate intrapersonal anxiety--using a dialogic seminar format ala Paolo Friere[20] for example, rather than the more familiar didactic mode.

The art of program design lies in combining these elements into a flexible program structure which allows for delivery in a group context, but may be adjusted at the individual level. The central issue is not only to be able to combine these elements but also to create an appropriate critical doubt-mass (in Chinese ti-yi-t'uan) for each individual. Many programs, deliberately or accidentally, contain one or more of these elements. Few of which I am aware are designed to keep the learner at critical mass throughout the learning experience.

Some programs do achieve the necessary levels of novelty in design so that the learner's initial experience splits from tradition (i.e. the projected l-o-e approaches the region of the fold-curve). Frequently, this condition is viewed as undesirable and modifications encouraged such that the end-run results. In programs for which intrapersonal anxiety is not explicitly treated as a controllable variable, one can only speculate about which of the five outcomes is more likely. From a knowledge of the population as a whole, it might be argued that "rationalization" and either one of the forms of "regression" is more likely than "collapse." Where "insight" falls with respect to these other outcomes remains, sadly, largely unknown. The literature relating to Maslow's self-transcendent stage seems to suggest that the proportion of "insight-full" individuals is small.

The attainment of a critical mass is, of course, only a necessary pre-condition for insight, or synergy in learning. While it is necessary, in this interpretation, to set the stage, it is the interaction of the elements within the program design that triggers the learning, not the mere presence of the elements themselves. In other words, it is not only novelty of context, content, or style, but the way the three work together to support and reinforce the goal of integration and developmental learning. For example, a course in counselling psychology would be not only novel in content, perhaps offering a structuralist interpretation, but also offered in an experiential rather than a didactic mode and presented within a mental health institution rather than a classroom on campus.

If the model is a valid interpretation of the process through which understanding is attained, it is now possible to list some of the attributes of an integrative educational design:

(1) An environment or context significantly different from that experienced previously by students--an urban environment for students from rural or suburban backgrounds; a foreign country for ethnocentric students; a small, intense group experience for only children and/or students from a large, amorphous institution, etc.

(2) Novel subject matter--a subject not readily available on the traditional campus, or a traditional subject presented in a non-traditional way--psychobiology rather than psychology and biology; general systems theory; phenomenology; linguistics; creative studies.

(3) A learning style that favors self-directed learning and self-discovery rather than dependence on external authority for direction.

(4) A structure that encourages intensive individual contact between faculty and students as well as a group learning experience.

(5) The use of direct experience to complement the vicarious experience of reading and observation to allow reality testing and validation of insight and understanding.

(6) Enough time for the experience to "ripen" and to be resolved. Since this is an individual issue, the time required is hard to predict for a group. Rather than to attempt to predict, it would be preferable to present the learning experience as one phase of an open-ended continuing process, time constrained as a matter of administrative convenience rather than educational program design.

(7) A program faculty with training and experience in group process facilitation as well as in-depth knowledge of an appropriate subject matter and the skill to present it in an integrative mode.

(8) A faculty that functions effectively in a relatively high risk, high stress, interpersonally intense situation, with an orientation toward problem solving, crisis management, and learning from experience rather than avoidance of it.

(9) A program management structure that allows for flexibility in program content and structure in order to accommodate changing circumstances in the environment in order to maximize opportunities for direct experience--i.e. an "open" system rather than a "closed" one.

(10) An environment rich in learning resources to facilitate access to the widest possible variety of opportunities for experience which can be related to the subject matter being studied, either deliberately or serendipitously.

(11) An evaluative process that provides continuing feedback throughout the learner's experience as well as a reasonably objective basis for determining a grade and/or academic credit at the end of the formal program.

(12) An evaluation process which includes consideration of both qualitative and quantitative aspects of learning.

Clarification of the last point may be needed. The qualitative aspects of learning are not well measured by available techniques based on analysis. The "quality" of a learning experience refers to the learner's ability to relate personally to the learning, to create a coherent whole of which the individual is an inseparable element, not what or how much is learned. This is a somewhat different use of the concept of "quality" which, in many institutions is treated as an objective phenomenon; for example, evaluating the quality of writing by the degree to which it conforms to a methodological ideal, rather than the degree to which the act of writing contributes to the writer's and reader's understanding of the subject.

A reality of the college curriculum, including that of the liberal arts institution, is that it tends to reflect the prevailing societal norms, interests and needs. Within our society, the analytic tools of technological development are more highly valued than the synthetical approaches to interpreting experience. The physical sciences are among the most methodologically and technologically evolved disciplines. The social and behavioral sciences have, in many instances, been modelled on them. Analysis, "scientific methodology," has been and probably remains the prevailing mode of intellectual inquiry. Indeed, as Russell Ackoff presents it:

> ...we use analysis and inquiry simultaneously. For example we speak of "analyzing a problem" and "trying to solve a problem" interchangeably. Most of us would be hard pressed if asked to identify an alternative to the analytical method.[21]

One reason for this difficulty, as I have asserted previously, is that methods of analysis can be taught, but a capacity for non-analytical thinking (synthesis) cannot. Having been taught a method, there is a tendency to over-generalize its application, to apply analytical techniques to problems which are non-analytical in character, such as the "evaluation of quality."

An immediate goal of program design is, therefore, to bring these two modes of thought into a better balance. As long as an analytic approach to problem solving is the sole or dominant mode, the learner's access to experience as a learning resource will be unnecessarily constrained. As Russell Ackoff has stated:

> These two approaches should not (but often do) yield contradictory or conflicting results; they are complementary. Development of this complementarity is (the) major task....[22]

The development of the complementarity between the analytic mode and the non-analytic mode permits the learner to understand not only the analytic view of structure but also the non-analytic interpretation of function. More importantly, we have the ingredients for a new expression of the learning equation:

$$\begin{aligned} \text{"Learning"} = \; & [\{F(\text{analysis}) + G(\text{non-analysis})\} + \\ & \{H(\text{intrapersonal anxiety}) + \text{Experience}\}] \\ & = \text{SYNTHESIS} \end{aligned}$$

An individual's learning is a function of the application of both analytical and non-analytical modes to his or her experiences which are perceived to be important life problems, the results of which contribute to dialectical synthesis, Gestalt formation. A variety of authors have identified and labelled this type of learning: "self-actualized," "enlightened," "*kensho*," "Vision-Logic," and other terms connoting the formation of a wholistic world-view or *weltanschauung*.

The elements in the center of the equation form an inseparable whole. Analysis and non-analysis remain unrealized intellectual concepts until their dialectic complementarity is triggered by experience with which anxiety, "suffering" is associated. Without the non-analytic, we have a method for the analytic interpretation of experience from a Behavioristic viewpoint which may lack functionality--i.e. alleviating the symptoms without solving the problem. Without the analytic, our view may be "novel" but lacking in structure and therefore utility. Without suffering, there is little or no motivation for change. Finally, without direct experience, the outcome of the learning process lacks the authority of "the supremacy of fact over thought," as Alfred North Whitehead calls it, such that:

> ...the supreme verification of the speculative flight is that it issues in the establishment of practical techniques for well attested ends.... In this way there is the progress from thought to practice, the regress from practice to thought. The interplay of thought and practice is the supreme authority.[23]

By inference, off-campus, field study programs with a high experiential component appear to meet the majority of the criteria developed herein for the design of integrative educational programs. Such programs, not surprisingly, are characterized by Gordon Walter and Stephen Marks[24] as being "therapeutic." The model discussed here suggests that such programs could be made even more effective by giving more explicit consideration to the role of interpersonal anxiety as an underlying factor in the developmental learning process. The necessity to create a "critical mass" for each individual student within the constraints of time and resources appears to be essential, as does the existence of an administrative mechanism for mediating and adjusting the program components within a relatively short time frame. The program structure must, therefore, include adequate feedback mechanisms for both the qualitative and quantitative outcomes.

Success in the design of an integrative educational program would be indicated by individual learning curves which exhibit discontinuities associated with the attainment of understanding as well as growth in knowledge. An individual whose learning curve exhibits such a discontinuity, it is postulated, will score higher on measures of ego strength and other indicators of a positive self-concept. The model suggests that such an individual not only increases cumulative learning more rapidly over time, but also enters into the next learning experience with less inertia to be overcome as indicated by the slope of the learning curve; the steeper the slope, the less the inertia and the greater the momentum (accumulation of negentropy).

The result of such a process has been called "systems thinking" or "Vision-Logic." It is the result of integrative learning through which:

> ...the formal mind establishes higher relationships....It is thus the beginning of a truly higher order synthesizing capacity, of making connections, relating truths, co-ordinating ideas, integrating concepts.[25]

Above all else, such a learner should display an increased capacity for independent thought emerging out of the dialectic which juxtaposes analysis and non-analysis to bring about a complementarity--a more complete world-view than can be obtained solely through either approach.

# # # # #

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Editor's Note

Most of the articles in this edition of *Issues* are based on papers read at the last two national meetings of the Association for Integrative Studies. The first was held in February, 1984, at Miami University in Oxford, Ohio. The School of Interdisciplinary Studies at Miami served as host and co-sponsor of the conference, whose theme was "The Future of Interdisciplinary Studies." Martin Trow's keynote speech to that conference appears as the first article in this *Issues*. The second meeting was held in San Francisco in October, 1984. AIS joined with AGLS, the Association for General and Liberal Studies, to co-sponsor this conference, which was hosted by San Francisco State University. Its theme was "Higher Education and the Citizenry: Reciprocal Responsibilities."

This third edition of *Issues* contains the greatest diversity of articles so far, ranging across the arts and sciences, with different authors emphasizing institutional analysis, or pedagogy, or philosophy--but all grappling with the meaning and practice of interdisciplinarity.

My thanks to the referees, to our word processor, Mrs. Joan Dickey; to my graduate assistant, Terry Phelan; and especially to my colleague, Stan Bailis; who have contributed immensely and indispensably to the production of this edition of *Issues*.

Raymond C. Miller
Editor

Martin Trow delivering the Keynote address
at the AIS conference in Oxford, Ohio, Feb. 4, 1984

INTERDISCIPLINARY STUDIES AS A COUNTERCULTURE: PROBLEMS OF BIRTH, GROWTH AND SURVIVAL[*]

Martin Trow

University of California, Berkeley

Introduction

In this essay I want to raise at least these questions:

1. Why do some innovative interdisciplinary programs succeed, while others fail?

2. What are the effects of the legacy of the 60's, when so many innovative programs had their start? How much of a burden is that legacy in the 80's? Is it necessary "to change with the times" and can that be done while maintaining the integrity of interdisciplinary programs?

3. What are the special difficulties encountered during the start-up years of interdisciplinary programs?

---

[*] Paper read as the keynote address at the Conference on The Future of Interdisciplinary Studies, sponsored by the Association for Integrative Studies, and the Western College Program of Miami University, Oxford, Ohio, February 1984. This essay can be seen as an extended footnote to Gerald Grant and David Riesman, *The Perpetual Dream: Reform and Experiment in the American College*, Chicago, Illinois: University of Chicago Press, 1978.

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4. How can we reconcile the reformist commitments of innovative programs with the necessity for these programs to establish good and warm relations with other more traditional parts of their host institutions?

I take it as self-evident that interdisciplinary studies at their best are among the most powerful and effective perspectives for teaching undergraduate students. Note that I said "among," and that is indeed the heart of my message. Interdisciplinary studies "embody programs of teaching and research that transcend the methods and subject matter of single scholarly disciplines or academic departments," and "seek to use perspectives of seemingly disparate disciplines simultaneously and interactively to define common problems, issues and ideas, and to pose solutions based on genuine dialogue."[1] When that is done, when interdisciplinary studies succeed, they are a joy to behold, and even more to take part in. I use the word "joy" because of the sheer pleasure in the intellectual play that they afford to students and teachers alike, the pleasures of roaming across disciplinary boundaries, and of finding connections and links, illuminations and insights in the ideas and discoveries of disparate disciplines.

Having said that, I must also say that I have seen powerful and effective teaching and learning in quite different forms and contexts. For example, the Undergraduate Research Opportunity Program at MIT, and its counterparts elsewhere, give to undergraduate students an opportunity to join ongoing faculty research projects, and bring them very quickly to the frontiers of a discipline, though often on a very narrow front. I recognize that undergraduate research done within departmental structures may well push against the boundaries of those disciplines, and resemble closely the kinds of research that are done within interdisciplinary programs, such as those at Western College, Miami of Ohio, or Worcester Poly. (And the blurring of distinctions between what is done in interdisciplinary programs and in departments may be the kind of imitation that is the sincerest form of flattery.) More important than where it is done, the rewards of actually helping to create knowledge through specialized research can affect a student's motivation across the board, and give to him or her a totally different sense of the provisional, the unfinished nature of science, of academic work, and indeed of intellectual life. And even the more routine forms of disciplinary study, the ordinary departmental major, if it is well-organized, can give a student the beginnings of a real familiarity with a body of knowledge organized as a discipline or a sub-discipline. It is true that this can become mere pedantry, or a premature introduction to specialized graduate study in an academic discipline. But the value for some undergraduates of studies in depth of a single discipline ought not to be dismissed too quickly. It may be that students, at least some students, need to gain familiarity with the methods and subject matter of a single scholarly discipline before they can transcend them.

I mention this not because traditional disciplinary studies need any further defense, and if they did this would hardly be the place for it. I mention it because I am interested in why some interdisciplinary programs and institutions succeed while others fail. And I have come to believe that the success or failure of these programs is only in part related to their quality or to the demand for them locally. To a great extent, I think, the success and failure of interdisciplinary programs are a function of their relation to the rest of higher education, in their own institutions and elsewhere. My reading of the history of innovative programs in higher education over the past two decades--and interdisciplinary programs especially at the undergraduate level have appeared most of the time as innovative programs--is that the fate of any given program has depended heavily on whether its founders saw American higher education as a failure which they would try to repair or redeem, or as a system of great richness and diversity to which they would add additional richness and diversity, seeking for their own ecological niche in the jungle of American colleges and universities. If their founders were sure that the rest of higher education, and that includes the rest of their own university, was incompetent or venal, then their innovative programs were created to stand in witness to that failure, and to their own calling to provide alternative models. And if I speak here of sin and redemption, of bearing witness and having a calling, the religious overtones are not accidental.

On the whole, programs that have abused their hosts while claiming unique and almost ethereal virtues, have failed. Those that have claimed a place in the spectrum of higher education to serve that segment of the student population which wants and can profit from what interdisciplinary programs and colleges can offer, have on the whole survived and flourished.

But while most of the people in this field may be chiefly interested in this latter group (among which I number Miami's Western College), that is to say, interested in what successful programs look like and how they work, I hope I can interest you for a few minutes in a consideration of why so many innovative and interdisciplinary programs of the sixties and seventies failed. I think that if we look at them closely we will learn something about the nature of educational reform in this country, and perhaps about American higher education more broadly, and about the environment in which innovations in higher education seek for legitimacy and resources. In this effort I have to start by locating the innovations that I will be talking about in the broader spectrum of academic reform in the United States since World War II.

Types of Academic Innovation

It may be useful to distinguish three different kinds of recent innovation or reform in American higher education. The first was the general loosening of the curriculum that took place in very many small colleges and universities during the decade 1965-1975, largely as a response or reaction to the heightened meritocratic pressures of the late 50's and 60's. The rapid growth of college and university enrollments in the 1960's--involving more than a doubling in the number of students--led to a very sharp competition for admissions to the elite colleges and greatly increased academic pressures on undergraduates who were competing for admission to graduate school. Students sought relief, and found a sympathetic ear among many faculty members who resented the dominance of the graduate schools over the liberal arts colleges both within and outside universities. The "reforms" which were adopted very widely gave students more freedom of choice in the curriculum and more freedom in the sequencing of their courses. Three of the commonest reforms were: 1) a sharp reduction or the abolition of required courses; 2) a free choice of curriculum, that is to say, a reduction in the sequencing of courses; and 3) student-designed majors outside of departmental boundaries.[2] These "popular" reforms were very widespread although rarely advertised, but they modified the means of education within the bounds of the existing goals of a research oriented university, and of the colleges that fed them.

Another type of academic innovation took the form of educational inventions designed to achieve learning in ways other than through traditional lectures and seminars. These reforms were less focused on the curriculum than on the modes of instruction, affecting the relationship of teacher and student and a body of knowledge or skills. The Undergraduate Research Opportunity Program at MIT is an example here, as are self-paced courses, the use of videotapes, and the significant reforms of engineering education pioneered in the Worcester Polytechnic Institute Plan. These are indeed academic innovations, but still lying within the assumptions of discipline-oriented colleges and universities.

A third type of academic innovations comprise what David Riesman and Gerald Grant call "telic" or purposive reforms.[3] These center on a significantly different conception of the goals of undergraduate education. Such ambitious aims require not just the reform of a curriculum or the invention of an instructional technology, but the creation of new educational institutions which embody these new goals. In a sense these institutions can be seen as a criticism of the central values of the research oriented multiversity, of the pre-eminence of the academic discipline and the academic career. These values--of "competitive excellence" in the service of specialized research and scholarship, based on individual achievement, and a cognitive style that subordinates "feeling" to "knowing," "being" to "becoming"--had in the decade of growth after World War II come also to dominate a wider circle of satellite four-year colleges, and through their power as models, a much larger number of more modest colleges and universities.

While the enormous expansion of higher education (and of federally supported research) after World War II greatly strengthened the disciplines as well as the reaction against them, it is important to emphasize that colleges designed in opposition to the dominant models began to emerge as long ago as the thirties. Among the older "telic" institutions were St. John's, Antioch, Bennington, Black Mountain, Goddard and Sarah Lawrence. But much larger numbers of such institutions emerged after World War II; among these were Old Westbury (both I and II), Franconia, Hampshire, Evergreen, Green Bay, the College of Human Services in New York, New College in Sarasota, and Stockton State and Ramapo Colleges in the New Jersey state system. They also included institutions embedded within larger and more conventional universities: examples here were Bensalem in Fordham, both Tussman College and Strawberry Creek College in Berkeley, Kresge College in Santa Cruz, Western College in Miami of Ohio, and Livingston College in Rutgers.

David Riesman and Gerald Grant in their book *The Perpetual Dream,* develop an interesting typology of these institutions they call "telic," or purposeful. They distinguish four types of such colleges by reference to their basic conceptions of education, their students' motivations for choosing the college, the institution's own valued ends, their social models, core values, educational styles, historical roots, and the nature of the authority that each invokes and accepts. The types they identify are the "neo-classicals," among them St. John's and the Tussman College at Berkeley; the "aesthetic-expressives," for example, Bennington and Sarah Lawrence as well as Black Mountain; the "communal-expressives," including both Kresge and Bensalem; and the "activist radicals," including Antioch College, Old Westbury in its first phase, and the College for Human Services in New York.

But while there is much to be said about these different types of "telic" institutions and the differences among them, they all shared certain characteristics in common. First, each had a sense of mission. They aspired above all to be distinctive, and the distinctiveness lay both in the set of positive characteristics which they embodied and also in their assertion that they were not like the "ordinary" college or university. The claim to "distinctiveness" is made by faculty and students in these institutions who are on the whole dissatisfied with the competitive life of the university, and yearn for a sense of identity; they want to be part of an institution that can evoke from them deep loyalties, and in which their own sense of themselves as persons is ratified and justified. For both teachers and students, to join such a place is not just to get a job, or to go to college: it is to make a commitment, a commitment that for the faculty may involve sacrifices in their academic career. For faculty especially, but for students also, joining such an institution may mean that bridges have been burned and that costly career choices have been made that reflect their deep personal and social ideals.

There is in all of these purposive institutions also an intensity in the student-teacher relationship that is rare in "ordinary" colleges and universities, an intensity partly reflecting their common recoil against research and publication norms. It also reflects the value held in all of these experimental forms of innovation that teachers and students are to be seen as "co-learners." They are not necessarily egalitarian--for example, they surely are not at St. John's--nor does it necessarily require the dominance of charismatic leaders. What they do share is the commitment to a community and the ceremonies of a community. In such institutions, as Riesman and Grant observed, "the important judgements are common judgements about whether students measure up to the ideals of the college, not whether they are excellent students in the traditional sense, as in the judgements of a departmentally organized faculty."[4]

The historian, Lawrence Veysey, captures the spirit of these telic institutions in a review of Martin Duberman's *Black Mountain*:

> Many of us yearn in some part of our minds for a college setting utterly free from bureaucratic harrassement, a place where nothing distracts from mutual learning and creation. The dream merges with that of community--an educational environment to be sure but one where life and classroom merge into each other, and where status dissolves in genuine human relationships.[5]

The primary values of these institutions are anti-institutional. What is valued is the enduring personal relationship, rather than the tangential and fleeting encounters of persons and roles that are so common in large traditional institutions. They are hostile therefore to the university model, the large, formal organizations of specialized roles and statuses, and are committed to small size, informal structures, and less specialized academic roles which blur the distinction between disciplines, between academic ranks, and between teacher and student. The curriculum places great value on interdisciplinary studies which drastically subordinate the disciplines (and their administrative arms, the departments) to the "natural articulations of knowledge" as in the neoclassical institutions, or to "creativity," as in the aesthetic-expressive institutions, or to the "human community" as in the communal-expressive institutions, or to "social change and the activist professional" in the activist radical institutions.

Institution-Building

I have been describing a broad movement in American higher education that includes programs and institutions that have succeeded and survived as well as others that failed and disappeared. I want now to look even more closely at some of the characteristics of those innovative institutions which put them at risk, and have led some to fail. I want to do that by looking at the early years of newly-created, purposefully innovative, "telic" institutions, to consider the peculiar problems and tensions that arose, and perhaps still arise, as they move from birth, through infancy, toward adult status and full maturity. It is the perspective of the institutional life-cycle.

Let me start by considering what are, or more accurately what were, some of the peculiar characteristics and advantages of the start-up years--the years of "institution building"--in these innovative programs and colleges.

1. The earliest years of a new and innovative program are marked by a highly selective recruitment of staff and students. Typically, the new institution attracted faculty for whom the college offered not a job but a calling, no 9-5 day but an opportunity and challenge. Founding faculty were quite often enthusiasts, true believers, for whom the institution and its philosophy was not just another educational option but a kind of secular religion.

Similarly, the students of this first generation were often brought there by advance publicity about the institution or program, in some cases by energetic efforts to bring to the institution the kind of student whom the founders believed would help give it its unique character. They were, on the whole, enthusiastic and dedicated to the ideals of the college. Moreover, many saw themselves as pioneers solving problems, and quickly gained the high sense of efficacy associated with the experience of a pioneer generation faced with a great variety of problems for which there are no institutional answers or precedents, or specialized problem-solvers already in place. The first few classes in such institutions were also often (but not always) better students: more imaginative, independent, and self-directed, more adventurous and more highly motivated. They often were a very hard class to follow.

2. The resources available to the institution in the first few years were often unusually abundant. There were commonly special start-up resources, one-time subventions from "special" funds for just such innovative ventures. In addition, the newly recruited staff was often given a planning year, or were recruited faster than the students so that there was an early favorable staff-student ratio. Very often, the first year or two in the institutions saw a staff-student ratio of about one to five or six. Three or four years later, it was one to twenty or twenty-five. The experience of that change alone was a shock that the young program had difficulty surviving.

3. The new college was, for obvious reasons, almost always very small. Small size allows the emergence of a "handicraft culture" and obscures the implications of the absence of procedures. Small size allows communal and often consensual decision-making. This may also be ideologically required, and in the beginning it was just barely possible, given the small size and the recruitment of staff and students around common values. Small size allowed each problem that arose to be defined as unique, to be solved in a communal atmosphere of sentiment, feeling, and comradeship, working together as substitutes for precedents and procedure.

4. Both the ideology of many telic institutions and the lack of precedent in all very new ones made for a readiness to treat each student, each problem, as if it were the first and wholly unique. "Every student is a unique exception,"--with respect to grades, to course requirements, and to everything else. (This principle, incidentally, exposed the teacher in these colleges to enormous pressures from solipsistic and exploitative operators among the students.) The lack of precedent and institutional procedures, the weakness of boundaries and routines also required that each case be the object of willful decision, one that squared with principle and ideal. Moreover, each such decision had to be made with great care and deliberation, both for its own sake and also because it would become a precedent. The experience of making a world and not merely serving it was for many of the participants both exhilarating and exhausting.

Characteristically, over time, it became increasingly exhausting and decreasingly exhilarating.

5. The new college, if it was embedded in a larger, more conventional institution, was at this very early stage not yet seen as a threat to other parts of the larger institution. Its demand on resources was not yet large, and even its opponents felt the necessity to "give it a chance" after the decision had been made to set it up. This was an important if temporary advantage of the new institution.

Partly as a result of all these special (if temporary) advantages, the first few years of life of a new telic institution were often marked by the euphoria of creation, and of high morale arising out of a steady flow of problems and the pleasures and rewards of "solving them" and building an institution.

Problems Arising From the Transition to Steady State

But for every Eden there is a world, and for young innovative institutions the agents of the world come not in the form of a serpent and an apple, but of growth. And with growth came the inevitable emergence of secondary relationships among people, in place of the primary relationships of whole persons that characterized the early years. This development was especially hard on the "communal-expressive" type of telic institution. (We see the consequence of growth in such institutions in the evocative picture that Riesman and Grant sketch of Kresge College at Santa Cruz, and the split that occurred within that college after its first few years.)

Students after the initial years start coming to an established institution. They are expecting to find a program in place, rather than to be helping to create one. This reflected and accelerated changes in the character of student recruitment; a different kind of student comes to an established program than to a brand new one in the making.

Moreover, there was a measure of faculty turnover during the first few years as some of the early founders left, disaffected by their experience in an institution which did not, and could not, remain permanently malleable and uninstitutionalized.

One result of a high level of faculty turnover (and the academic market was much stronger before 1975) was to weaken further the new program's already weak capacity to develop formal procedures and organizational routines: It increased the instability of the students' experience, and it also changed in the aggregate the character and values of the staff. With faculty as with students, the second generation of recruits is never like the first and founding generation. The difference between them was that in the faculty, the first, second and third generations of recruits were intermingled; and differences among them in the passion and purity of their commitment made for dissension and conflict.

After a year or two, typically the faculty and staff began to search for ways of managing overload. The overload arose essentially out of the fact that increasing numbers of students began to come to an institution whose ways of working and teaching were highly personalistic, and ill adapted to the conditions of mass education for which many of these telic institutions were destined. The initial response of such institutions was always to try to expend the personalistic response developed in the first year or two to the larger numbers coming in the third and fourth years. When this was experienced as impossible overload, there was a search for procedures to manage the relationship between faculty and these larger numbers of students. And ironically, another source of overload was the growth of demands on the faculty arising from the necessity of their developing the very procedures needed for managing large numbers. The third and fourth year of such institutions was often experienced as the worst of both worlds: a large number of students without the routines and impersonal procedures which allow large numbers to be taught and managed in more traditional programs and institutions.

On top of all this, there was characteristically the loss of the early extra resources. Governing agencies started to require the new entity to function at cost levels of comparable traditional programs or institutions, or of traditional units in the host institution. This was partly due to pressures from older units. There are enormous leveling pressures in multi-unit institutions: legitimacy requires equity, and in many such institutions marked differences in per capita support among departments are defined as inequalities, and inequalities as inequities. These norms did not usually operate during the very first start-up years, and that is in part why the Golden Age of such telic institutions usually lies in the institution-building years. (That, of course, was not the only reason.) But when these norms were applied, they had drastic effects on the budgets of these innovative programs, and on the sometimes costly practices that they had developed.

Sooner or later during the innovative institution's transitional years it experienced the emergence of conflict, latent but obscured during the early communal phase by the consensus of a small, relatively self-recruited faculty and student body around a common ideology. (In some institutions--e.g. Old Westbury I--fierce conflict was present from the very beginning, as if by design.) Conflict always emerges around conflicting interests, as for example, between the tenured and the non-tenured faculty, the publishers and non-publishers, the faculty and the administration. It arises also around ideology, as between people on the "left" and those on the "right." It also arises from differences between those who prefer spontaneity and those who prefer predictability and order, between those who place greater value on personal qualities and those who would reward achievement. These differences come to be more or less organized, structured and contained within most colleges and universities--where they don't, the department or institution suffers. But telic institutions usually have few procedures for adjudicating conflict--conflict tends to be seen not as part of the ordinary life of the institution, but as evidence of the loss of Eden, as a failure of the communal ideal. The emergence of conflict is especially painful in a communal setting where people interact as persons rather than in roles; in such circumstances, conflict tends to be personalized. Moreover, where decisions are meant to emerge from consensus, conflict often results in decision paralysis: the "Polish parliament" phenomenon.

Another aspect of the transition to a steady state after the first few years in the life of these innovative programs was the growing evidence of faculty fatigue arising out of a continuing overload. This overload was due in part to the highly individualized modes of instruction, associated both with educational ideology and the favorable staff-student ratios of the first few years, and in part the constant meetings associated with participatory decision-making without procedures or precedent.

This overload and fatigue in turn led to a pattern of withdrawal and privatization on the part of at least some of the faculty members. As they stopped going to meetings, that in turn delegitimized the decisions made at those meetings. (Non-participation delegitimizes decisions more quickly where there is a reliance on participatory democracy and the politics of consensus.) Also, it further overburdened the continuing participants, and drove more of them to reduce some of their exhausting involvement in the never ending process of making decisions about every event as if it were absolutely new and unique.

Privatization--the reduction or withdrawal of their involvement in the political life of the institution--by at least some of the faculty does not have necessarily destructive consequences in traditional institutions, nor is it severely condemned there by the other participants. In the early days of a telic institution, by contrast, it is seen as a "betrayal" and evidence of the failure of the communal ideals. The expectation in such institutions was that each faculty member had to continue to give evidence of a deep and abiding commitment to the college's ideals, and that participation was in response to an inner calling. Such institutions demanded not just a fair day's work but "a full measure of devotion." Any qualification of that devotion, as, for example, a genuine but *limited* commitment to innovative forms of undergraduate teaching, is quite unacceptable in the telic institutions.

As time went on, routinization, conflict, privatization all in one way or another were growing evidence to the participants that the institution was not able to maintain the requisite levels of spontaneity, creativity, community, commitment and involvement of all of its participants. This growing recognition, feeding back on the institution, was reflected in declining morale, animosities among colleagues and growing evidence that *ad hoc* procedures do not work very well. All of these developments, the institutional as well as the psycholgocial, contributed to a widespread sense of failure among faculty members. In these institutions, the judgement of failure was made by not any reasonable comparison with other institutions of higher education, but rather against the utopian criteria that the founders had in mind when they created the institution. But against utopian criteria, only failure is possible.

There are other reasons for the difficulties that some of these innovative colleges and programs experienced, difficulties that were more a consequence of the nature of their host institutions than of the innovations themselves. For one thing, the very fact that innovative colleges were so passionately devoted to teaching made them suspect to a large part of the faculty of the research-oriented university. And in the big research universities, where the academic career is so closely linked to research motivations and achievements, it was difficult for these innovative "teaching" colleges to attract and retain many regular faculty.[6] They too often lived on the energies of their senior founders and a small band of temporary non-tenured and non-tenurable assistants, and died when those energies were exhausted.

Moverover, these programs often were funded as "experimental" units, without a permanent "line" in the operating budget of the university. The resources they drew on were designed for academic innovations, and were easily withdrawn when university budgets were cut, or were shifted to other newer claimants for experimental funds. After all, when a college program had been in existence for five years or more, it could hardly be considered "experimental" any longer. It was then often told that it had to find a place on the ordinary operating budget of the university, but could not. So a major difficulty for some of these programs was that they were never fully institutionalized, either with respect to staff recruitment or budget.

To sum up, the difficulties faced by innovative programs during their early start-up years are broadly of two kinds: those inherent in the transition from an experimental or pilot program to the status of a regular and institutionalized school or program, and those that result from the romantic, evangelical and utopian ideologies of some of the founders of innovative programs.

The two kinds of difficulties, when found together, are nearly always fatal--they tend to enhance or exacerbate each other. The former set of problems are still with us, or rather with new programs. The latter, I suspect, are less so--but they are not wholly absent, nor are they likely to be wherever passions and commitments to innovations in undergraduate teaching are strong.

Successful Transition to the Steady State

The successful transition of an innovative program from its initial phase to a stable steady state is highly dependent on its success in developing academic and administrative routines. "Routines" and "routinization" have a bad name in academic life. They are thought to be the enemies of creativity, spontaneity, and of the lively interaction of people and ideas that makes for the best learning and teaching. A great deal of academic innovation is designed precisely to break routines, and enable institutions to find new ways of pursuing familiar ends.

Routines are viewed with special hostility in innovative institutions during their formative years. But the evidence suggests that for such institutions there are two possible paths. One involves a search for stability; the other is marked by a steady slide toward collapse. Bensalem at Fordham, and Old Westbury I were illustrations of what failed telic institutions looked like before they were mercifully terminated. By contrast, those institutions that survived were marked by a search for academic routines and institutional procedures that would be compatible with their basic purposes. And those routines that were not at odds with an institution's goals were likely to be routines that an institution chose to create rather than those it fell into.

What are some of the functions of routine? Some routines can be seen as "solved problems" thereby conserving the time and energy of participants. Another name for routines is regular procedures. Until it develops procedures, a new academic unit is likely to spend a very considerable amount of time and energy in discussion and debate about each case or problem, as well as about all the principles associated with it.

But academic routines are not necessarily the enemy of creativity and spontaneity; on the contrary, they make it possible to respond to some occasions, persons and issues in wholly unroutine ways. Institutions which resist developing any routines demonstrate how oppressive (and uncreative) an educational environment can be in which all people and problems are defined as absolutely unique and as having an equally urgent claim on the faculty's time and energy.

Routines are also the basis of institutional predictability. They allow people to act with some idea of how others are going to act and react in specific circumstances. An example here is the establishment of faculty office hours. Office hours are especially interesting precisely because many innovative programs and institutions resisted just such "routinization" of the student-teacher relationship. They argued that teachers should be available for spontaneous interactions, and that the very idea of office hours is at odds with the kind of close personal relationship between student and teacher that the institution is designed to foster. But being always potentially available was one of the sources of strain and overload on teachers in these institutions, which in turn led them to find other ways of rationing access to them by the growing numbers of students. And those other ways--especially privatization and "hiding"--have other consequences for the life of the institution which are more deleterious than is the "routinization" associated with establishing office hours.

We can look at the functions of routines in yet another way--by considering the outcomes of their performing these several functions. Routines are "solved problems" and introduce a certain economy, both of energy and money, into the institution. The problems that are dealt with by routines and procedures do not have constantly to be solved. The routine as a basis for predictability means that the institution is able to plan and coordinate action without constant consultation among its members. The main business of the institution can then be teaching and learning, and not meeting and decision-making. Predictability also provides a measure of psychological security to its members.

The provision of legitimacy by routines is illustrated by those routines which become procedures--accepted ways of doing things. Procedures, equitable and predictable ways of reaching decisions and adjudicating disputes, are the very opposite of arbitrary rulings and *ad hoc* decisions in problem situations. The hostility in the early years of many innovative institutions to all procedures had as an unintended consequence the denial to the institution of one of the most powerful forces for gaining and *holding* the willing participation of its members, that is, the shared sense that the institution is operating in fair and equitable ways, ways that are embodied in its broadly accepted procedures.

One crucial question in relation to routines for any institution, and not least for those in transition from institution building to steady state, is: what aspects of the life of the institution should be subject to routine and "administration," what left to spontaneous response, and what left to group decision-making, i.e. the political process? Institutions have only this limited number of ways of reaching decisions on academic issues and the determination of what kinds of decisions are or should be made by which of these different processes tells a lot about the dominant character and values of the institution.

The tension between spontaneity and routines is inherent in education. It is a question of what is given and what is problematic. If everything is problematic, then the world is as William James saw it to be for the newborn infant, "a bloomin', buzzing confusion." On the other hand, if nothing is problematic, then the institution has in fact ritualized its operation, that is to say, transformed its means into ends; it is wholly in the service of its own continued operation. A danger for every institution, and perhaps most sharply for colleges and universities, is the tendency to resolve the tension between spontaneity and routine either by resisting the emergence of any routines, as in the failed programs of the 60's, or by routinizing everything possible, as in the dreariest departments we know.

Lessons for Interdisciplinary Studies

Why raise these questions now, when most of these innovative institutions are either dead or safely institutionalized? My motive, I hope, is not to give support to the principle which, it is alleged, governed the University of Oxford for so many years--i.e. that "nothing should ever be done for the first time." I think there are other and better reasons for looking at innovative institutions, and at their difficulties during their early years. One of these is to learn about the relations of individuals and institutions under the conditions of high stress, in which institutional mechanisms for adaptation to stress and the resolution of conflict--that is to say, the mechanisms which permit institutional survival and the achievement, or at least the pursuit, of intellectual goals--are highly visible by virtue of their very weakness or absence. The extreme case is a useful comparative case, throwing into bold relief what otherwise one takes for granted in ordinarily successful functioning institutions where the observer is lulled by familarity and routine, and where the mechanisms for survival are obscured by their interpenetration with each other in a web of patterns and activities which we cannot easily disentangle.

So one motive for studying innovative institutions is the identification of institutional mechanisms for coping with stress and change, and a clarification of their functions in higher education.

Another motive for our interest in "telic" institutions lies in the light they can shed on the potentialities for purposeful social action in higher education, and a better awareness of its limitaitons. It is one thing to create institutions with broad and largely traditional social functions--for example, a college--and then allow it to find its functions through its institutional forms and processes. It is rather different to create a program or institution that means to achieve new ends through specific intended means--where what is being specified in and by the institution has a close link between means and end. Anyone interested in educational policy may find in telic institutions some of the possibilities, problems and limitations of purposeful innovation in higher education, as contrasted to the responsive adaptations that are our more common springs of action.

Finally, it may appear that I have been talking more of the past than of the future. But as we have been warned, if we forget or ignore the lessons of the past, we are condemned to repeat them.

What are those lessons? As I read our recent history, here are some lessons for interdisciplinary studies.

1. First, programs of interdisciplinary studies can be critics of other more conventional discipline-centered studies; but they ought not to be their enemy. For one thing, the disciplines are simply too strong, too institutionalized in the academic departments. Departments are the forms that the disciplines take in our colleges and universities; they link the organized bodies of knowledge, and their research and scholarly activities, to the administrative units of universities--the units that appoint and promote faculty and manage the academic career, organize most of the undergraduate curriculum, and all of graduate studies. We cannot fight the disciplines; they manage the creation and extension of knowledge across national boundaries, and almost everywhere control the reward structures of both teachers and students. We can point out and demonstrate that discipline-

based departments are not always the best units in which to organize instruction; and that there is a difference between the creation and transmission of knowledge, and the deepening of understanding, and that the latter is uniquely served by interdisciplinary studies.

I think there is a broad sympathy for and acceptance of that perspective even among specialized and self-limiting disciplinarians. But that sympathy is likely to disappear if the interdisciplinary studies movement claims not only that it adds something important and unique to the diversity of forms of higher eduction, but that it is the only way or the best way to organize higher education.

2. Second, I have said that many interdisciplinary studies programs have a certain evangelical element to them, and that is only a short step from fanaticism. Almost a century ago, Peter Finley Dunn, the wry commentator on American life and customs, observed that "A fanatic is a person who is sure that God would be on his side if He only knew the facts of the case." There is something of that spirit among partisans of any movement; the trick is to find a way to reconcile partisanship and commitment with tolerance and civility. Can we be passionate partisans without abusing our neighbors, especially when resources are at issue?

3. And finally, and here I would anticipate spirited disagreement within the community, it may be that interdisciplinary studies are not for everybody; that they are, so to speak, a curriculum for students (and teachers) who have an usual love of learning, who are self-motivated, and who are curious beyond the average about the world they live in, and who welcome chances to see that world, its history, social structure, politics, economy, art, literature, and its social and environmental problems, in a perspective that transcends the disciplines. We can, of course, try to engender and encourage that curiosity and motivation, but when those qualities are absent, and stubbornly absent, interdisciplinary studies may not be the best way to reach students who fear and resist the play of mind, the unfamiliar connection, the disturbing insight. And it may be that interdisciplinary studies, having made peace with its institutional environments, needs to find and acknowledge the limits of its relevance to American higher education, at the same time as it extends and fulfills its own intellectual potential as a unique way of learning and teaching.

NOTES

[1] *Newsletter*, Association for Integrative Studies, #13, 1983.

[2] On the sources of these pressures on students and some of their reactions see Christopher Jencks and David Riesman, *The Academic Revolution*, (Garden City, N.Y.: Doubleday) 1968, see Chapter 1. See also Martin Trow, "Bell, Book, and Berkeley," *American Behavioral Scientist* (May-June 1968).

[3] Gerald Grant and David Riesman, *The Perpetual Dream*, (Chicago, University of Chicago Press) 1978.

[4] *Ibid.*

[5] Quoted by Grant and Riesman, *Ibid.*, p. 33

[6] See Grant and Riesman, *op. cit.*, pp. 370-373.

AGAINST AND FOR HOLISM:
A REVIEW AND REJOINDER
TO
D. C. PHILLIPS*

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INTRODUCTION

Those of us who justify interdisciplinary work by appeal to holism must pay attention to well-made cases against it. D. C. Phillips' case is one. He maintains that holism, taken seriously, can't work.

Phillips sees in holism three distinguishable theses about complex entities and ways of dealing with them more appropriately than can be done by the traditional scientific method. The first, which he calls Holism 1, contends that wholes emerge from the association of their parts and can neither be investigated adequately nor explained by mechanistic analysis. Holism 2 identifies the reality of wholes in powers of organization that cannot be explained by reduction to the properties of their parts. Holism 3 is a call for conceptual terms referring to wholes--a call that sometimes denies that such terms can be rigorously developed under the prevailing scientific image of nature. Certain positive aspects of these theses have merit, in Phillips' view, but their negative claims about the scientific method are untenable. For him, the method itself is so reasonable and moderate that all scientists, even holists, are bound to use it. The futility of holism follows from its efforts to reject a method that it cannot avoid.

The literature of holism is large and difficult because it is expressed, often vaguely, in the specialized jargons of many different disciplines. Nevertheless,

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Phillips presents an ordered account of it that clearly delineates holism's main theses and applications as they have been developed since the mid-nineteenth century in several fields--philosophy, biology, psychology, sociology, anthropology, historiography, political science, and general system theory. His treatment is closely reasoned, carefully documented, and based on a thorough grasp of the doctrines he finds wanting. It is, consequently, worth going along with him to see in more detail what he thinks holism is and has been, what he finds wrong with it, and what's left of it when he's done. It is also worth considering the possibility of a rejoinder to his case. For if his case is logically necessary, holism is not.

THE NATURE OF HOLISM

The Theses

Holism 1 had ancient origins but came to modern prominence following the Romantic movement when it was formulated by certain neo-idealists in philosophy and in biology by the organicists. Done for the most part between 1880 and the later 1920's, this work generally reflects the theory of internal relations developed earlier by Hegel and his disciples: For things to exist as parts, rather than as isolated entities, the wholes to which they belong must also exist. Things connected as parts in a whole have "relational properties" that are different from their characteristics in isolation. Parts and wholes are reciprocally influential, so that neither term can change without altering the other.

From these broad notions, neo-idealists like F. H. Bradley, A. E. Taylor and J. McTaggart derived five more specific ideas that form the philosophical core of Holism 1. First, the analytic method is inappropriate for the study of complex wholes and their parts. Analysis separates parts from the whole in order to investigate them as things in isolation, thereby depriving parts of their relational properties and wholes of their coherence. Second, because relational properties are among the defining attributes of parts, parts cannot be understood as such outside of the wholes to which they belong. Third, wholes are more than the sum of their parts considered as isolates because wholes include the relational properties of their parts. Fourth, wholes determine the properties of their parts in the sense that altering the whole (e.g. by adding, deleting or substituting a part within it) necessarily alters relationships obtaining among parts. Fifth, parts are dynamically interdependent in the sense that changes in the properties of any one will change the relational properties of all the others and, consequently, the nature of the whole itself.

Organicists advanced similar ideas in biology, chiefly because they doubted the ability of mechanistic analysis to explain the discoveries about vital processes that were being made on every hand: Evolutionists noted spontaneous variations in individual members of a species that appeared to spread in blended or diluted form among subsequent generations. Microscopists revealed the internal complexity of the cell and its nucleus, making the already elaborate processes of cell division and reproduction that much more intricate. Embryologists observed that, following tissue excisions, the development process altered so as to nullify the effects of the damage as much as possible. Naturalists pondered the regeneration of lost body parts in some species, and the ability of even simple organisms to modify their activities in relation to varying circumstances.

It was the observed complexity of living things, the intricacy and variability of their processes, that raised doubts. Mechanism insists that natural events can all be explained in terms of basic entities and forces operating determinately in accordance with physico-chemical laws. But what entities would be basic enough? The cell was complex and even its parts had parts. Molecules and atoms seemed too small to contain truly intricate mechanisms; and the forces acting upon them appeared too determinate to account for variability. Rejecting mechanism, organicists fastened on the relational properties of parts to account for characteristics that seemed only to emerge in the functioning of whole organisms and total ecologies. The rediscovery of Mendel's particulate theory of inheritance did not blunt the holistic thrust of organicism, and it was not until Crick's and Watson's time that a fully mechanistic analysis was achieved. Meanwhile, Holism 1 flourished in the work of biologists like the brothers Haldane, R. Virchow, the vitalist Hans Driesch, E. Montgomery, and later, J. H. Woodger, C. L. Morgan, E. R. Russell and W. E. Agar.

In Holism 1, then, organic wholes are identified with their emergent characteristics--attributes manifesting the relational properties that their parts acquire through association. So seen, wholes cannot be explained or predicted from knowledge of their parts alone. For, as Phillips notes, scientific explanations and predictions can always be formulated as deductive arguments which, to be valid, must contain no terms in their conclusions that are not in their premises. Since premises based only on knowledge of parts do not refer to associations, characteristics that emerge from associations cannot be deduced from them.

But this line of argument leaves open the possibility of explaining a whole's emergent characteristics in terms of its parts once the characteristics themselves are known. For the characteristics can be regarded as instances of interaction laws holding for the classes of things to which the parts, taken separately, belong. Such laws, combined with information about parts, yield the very statements of relational properties that are needed to deduce the whole. Organicists may balk at this claim, which is the central tenet of reductionism. But, Phillips insists, reductionists can logically both assert their claim and accept the organicists' view of emergent phenomena--which are, after all, what they, no less than the organicists, intend to explain. Accordingly, he separates the formal rejection of reductionism from Holism 1 and repesents it as Holism 2 through arguments developed by the biologist Paul Weiss since the 1920's.

Weiss accepts the basic ideas of Holism 1, but adds that even knowing the interaction laws and relational properties of parts is not enough to explain the emergent characteristics of wholes. For these characteristics only exist on the level of the intact whole; and parts, which exist on subordinate levels, do not contain information sufficient to describe fully much less to deduce the whole. At bottom, wholes are as real and as much possessed of properties as are their parts. Such properties manifest principles according to which wholes effect the organization of their parts. These principles must be sought on the level of reality at which they operate, and they alone are sufficient to explain the characteristics of wholes emergent at that level.

On these grounds, proponents of Holism 2 challenge the sufficiency if not the validity of analytic method and the doctrine of mechanism--the first because it proceeds by decomposing wholes; the second because it seeks nothing of explanatory significance at the level of wholes. Reductionism is rejected outright because it misrepresents the explanatory problem at issue: Taking the emergent characteristics of wholes as given, reductionists treat them as constituted by and therefore reducible to the properties of interacting parts. For them, the problem is to discover the interaction laws and relational attributes of parts from which given emergent characteristics can be deduced. In Holism 2, the problem is to discover the organizational principles that govern and therefore explain both the whole's emergent characteristics and the interaction patterns of its parts.

Phillips identifies Holism 3 in statements calling for the development of scientifically useful terms that describe the organizational features of wholes, their emergent characteristics, and the relational properties of their parts. This does not require full acceptance of Holism 1 or 2, nor does it conflict with analysis and reductionism. David Easton, for example, has demonstrated the usefulness of treating political life as if it were an open system possessing inputs and outputs, interactions and feedback loops. Such terms occasion descriptions stressing the interdependency of political phenomena and the organizational dynamics by which their operate. But Easton insists that his strategy is essentially conceptual, not an assertion that the system he posits is physically real. In this he breaks with Holism 2, and he goes on to break with Holism 1 by asserting that analysis must follow conceptualization. Analysis is our only means of identifying the real things whose relationships interest us and, consequently, of providing an empirical basis for theories that can explain the phenomena we've described. One need not admit the integrity and reality of wholes in order to make use of concepts about them.

But Holism 3 has been used more ambitiously by proponents of Holism 1 and 2 who want to overhaul the conceptual bases of science: The prevailing image of nature in science reflects the assumptions of analysis, mechanism and reductionism. Hence, nature is conceived as if it were composed of truly elemental things and forces that can be examined separately for their abiding characteristics and explained by the fundamental laws they obey--laws that can also account for aggregates emerging from the interplay of nature's elements. This image should be abandoned and nature should instead be conceived as a

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hierarchy of organizational levels so arranged that wholes at any given level can be parts of higher level wholes and have lower level wholes for parts. As wholes become parts of higher level wholes, they acquire new relational properties that are relevant to their operation at that level and non-existent at levels below it. There simply are no relevant matters "more fundamental" than those which exist as a function of the whole in question. So the scientific study of any whole must be guided by conceptions developed for the level of organization at which it is taken to exist.

Phillips points to arguments for this version of Holism 3 in Weiss' work, but he elaborates the thesis primarily in terms of general system theory (GST) and its acknowledged founder, the biologist, Bertalanffy. Rooted in organicism, GST defines its basic object of study, the system, as a complex of interacting components. Wholes are systems, and while wholes must differ substantively at different levels, there are nevertheless general principles that hold for all systems regardless of what their components and binding forces or relations are. It is the prupose of GST to discover these principles and to express them in a "logico-mathematical" formalism that can be used across the sciences to effect the study of wholes as such. There is here no resort to matters more fundamental than the whole itself. Rather, the whole is described and also account for aggregates emerging from the interplay of nature's elements. This image should be abandoned and nature should instead be conceived as a hierarchy of organizational levels so arranged that wholes at any given level can be parts of higher level wholes and have lower level wholes for parts. As wholes become parts of higher level wholes, they acquire new relational properties that are relevant to their operation at that level and non-existent at levels below it. There simply are no relevant matters "more fundamental" than those which exist as a function of the whole in question. So the scientific study of any whole must be guided by conceptions developed for the level of organization at which it is taken to exist.

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Holism in Social Science

Holism is often held to be as important in social science as mechanistic analysis is in physical science. Phillips pursues this claim by identifying resemblances between the holistic theses and several leading ideas about how the behavior of humans should be studied. Since he also uses these resemblances to assign the faults of holism to much that is done in social science, we should indicate what the similarities are--hence, what sorts of ideas are at stake--before considering his criticisms directly.

A fair amount of work in the social sciences is concerned with relationships as proper objects of inquiry that cannot be understood in terms of their parts alone. Interpersonal relationships are a familiar example, and their treatment closely resembles Holism 1: Terms like "spouse" or "credit" assume the relationships "wife/husband: and "lender/borrower" in that "wife" and "lender" do not exist apart from"husband" and "borrower." So, for example, information about women as individuals will not suffice to explain their behavior as wives or lenders because information about their own relational attributes and those of their husbands or borrowers is needed. Likewise, information about both pairs of terms is needed to account for the spousal and credit relationships respectively.

As early as 1884, John Dewey used these essentially Hegelian ideas to characterize "knowing" as a dynamic relationship between knower and known that held for the organism/environment nexus generally. Later, in works done with A. F. Bentley during the 1940's, this imagery was used to delineate a "transactional" approach that the authors deemed necessary for the study of the psycho-social lives of humans: People are organisms whose traits as separate individuals are not the same as the relational attributes they acquire from interpersonal ties. Networks of such ties are the social environment at any moment. Human acts, based on present knowledge acquired from interpersonal ties, manifest the relational attributes of persons. The consequences of such acts are shaped by the networks of interpersonal ties through which they pass. They become the environemntial conditions about which humans must learn in order to act again. It is this on-going dynamic connection between the relational attributes of persons and of their societal context that accounts for psycho-social life, not the separate attributes of individuals or of their environment.

Durkheim's argument of 1895, one of the founding ideas of modern sociology, was, like Dewey's, focused on relationships among persons. But his points and purpose were somewhat different. Where Dewey stressed reciprocal influences in the organism/environment relation to account for knowledge, Durkheim emphasized its asymmetry in order to establish the reality of social forces. Individuals can scarcely affect the networks of interpersonal relationships constituting their social enviroment. But the networks generate pressures that effectively shape the behaviors of individuals. Explanations of these pressures are to be found in the networks that generate them, not simply in the psychological functioning of individuals.

Differences aside, these arguments resemble Holism 1 in that they clearly present networks of interpersonal relations as organic wholes whose parts can neither be separately understood nor used by themselves to explain the characteristics of the whole. As well, they both advance concepts devoted to the study of social wholes--Holism 3. And both are plainly opposed to methodological individualism--a major form of reductionist thinking in the social sciences.

Individualists like the historian J. W. N. Watkins and the economist F. A. von Hayek do accept the reality of emergent phenomena in social life--of institutions, for example, or social structures or cultures that must emanate from enduring relationships among persons. They even grant that partial explanations of some emergents in terms of others are possible, as when inflation is attributed to full employment. But, they insist, full explanation requires such phenomena to be deduced from laws of individual behavior and statements about the properties of specific persons. For social wholes are not physical entities but conceptual constructions inferred from the observable activities of people. As such, wholes cannot be said to have any motive force of their own--the sorts of interests and aims to which explanations of human behavior must ultimately appeal. Nor, for the same reason, can wholes be directly observed and made the subjects of empirical laws that are needed in scientific explanations. Thus resort to individuals is necessary if full explanations are wanted.

As we have seen, Phillips takes this sort of reasoning to be logically compatible with Holism 1. Accordingly, he doubts the sufficiency of organicist rejections of methodological individualism like those advanced by Dewey and Durkheim. For a stronger expression of Holism 2, he turns to the more recent argument of M. Mandelbaum, who declares outright that concepts referring to forms of social organization cannot be completely reduced to concepts referring to the thoughts and actions of particular persons. So, for example, we can't explain in individualistic terms why people who are as individuals different nevertheless behave similarly toward a bank teller, nor why the teller behaves similarly toward them despite their individual differences. At some point we must appeal to the fact that the parties to this interaction are customers and an employee of the bank. That the parties all know this is a psychological fact. But what they know about is a social fact that is necessary to the explanation of their behavior. In effect, societal things and the facts about them are as real and fundamental as individuals and the psychological facts abut them. Reductionists reject this reasoning. For Phillips, their opposition is the basis for separating Holism 2 from Holism 1 which reductionists can accept.

Enough has already been said about general system theory to suggest its relevance here. Phillips regards it as little more than a modern restatement of Dewey's ideas. But he does note that the generality of the system concept invites application to a wider range of relationships than those which can be characterized by interpersonal or as having to do with the organism/environment

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relation per se. Easton's use of it in political science, mentioned earlier, illustrates this point as does another example of GST Phillips examines--A. Koestler's discussion of language as a hierarchically ordered system in which initially generalized and implicit intentions emerge, through differentiation, as specific ideas in articulate speech. These examples deal with relations among systemic functions, like information processing, rather than with persons as such. Combined with the references in Phillips' notes and bibliography, they serve to indicate that GST has been associated with all three forms of holistic thinking in the social sciences since the 1950's.

The concepts of structure and function are made vague by a welter of varying definitions and usages in the social sciences. But Phillips clarifies matters sufficiently to show how both concepts may have holistic connotations. Thus structuralists usually argue that human social behaviors are not random but ordered or related--partly in terms of the biological needs they serve, but more importantly by virtue of the sociocultural rules they obey. And while these rules may vary substantively across groups, they are themselves related in ways that are regular enough to be expressed as universal laws. In this argument, "structure" refers to higher level or universal relations that hold as laws for lower level relations--for the rules in a given society that hold in turn for yet lower order relations embedded in the interactions of specific categories of persons.

Different brands of structuralism locate the origins of universal relations differently. In the case Phillips examines most closely--Levi-Strauss' anthropological account of the matrilineal avunculate--they originate in mental functioning that is the same for all people. But structuralists who are differently inclined, say toward economic universals, may argue differently about origins while remaining thoroughly holistic. What is necessary is a focus on total systems of relations as opposed to their elements. Origins aside, the laws of structure can only be discovered where they are actually expressed--in the forms of relations among social categories of persons that comparison shows to be regular across groups. Variations at lower levels of observation can be deduced from (explained by) these laws. Since the reverse is not true, this argument is often used to reject reductionism (Holism 2) and to call for wholesale conceptual reform (Holism 3) along lines that are largely organicist in nature (Holism 1).

The concept of function is commonly used to explain a system's characteristics in terms of how they help to satisfy its needs. Links between characteristics and needs may be intended by a system' s members (manifest functions), or not (latent functions). But a functionalist inquirer must have a theory that accounts for the system's needs, and some means of showing that the characteristics in question are the best or only way of meeting them. The inquirer need not assume that all characteristics have functions or that all functions are only beneficial.

Functionalism is often associated with evolution theory, as when a species' characteristics are shown to have been selected from various possibilities for their effectiveness at meeting particular adaptive or survival needs in a given environment. But functionalists can also use theories which do not posit the usual evolutionary apparatus of variation and selection. So, for example, GST proposes that any self-regulating or cybernetic system "needs" ways of gathering information about its internal and external states, ways of evaluating these states in terms of its preferred conditions, ways of deciding upon and effecting actions that will make its actual states conform to those it prefers, and ways of performing these steps more-or-less continuously. All of this may certainly serve adaptive needs, and many functionalists so argue where the evolution of "intelligence," or "consciousness" or other aspects of high cognitive capacity are at issue. But the key purpose of GST used in this way is to explain the existing characteristics of a system by showing how they meet its theoretically postulated needs.

In either case, functionalist arguments become holistic when they treat needs and characteristics as emergent phenomena deriving from relationships among a system's elements rather than from the elements taken singly. Thus, evolutionary functionalists argue holistically when they invoke the organism/environment relation in order to explain environmental conditions as effects of adaptive characteristics that a species acquired earlier. General system theorists argue in formally similar ways when they explain "feedback" in cybernetic systems as a complex relationship among objects and events external to the system, its sensory receptors, and its ability both to remember its own actions and to distinguish them from the actions of other things.

The difference between these uses of evolution theory and GST points to an important but often overlooked distinction within functionalism and structuralism as well. GST, and theories like it, tend to be concerned with synchronic relations--with the way a system's structural elements and their functions co-act to produce its emergent characteristics at any moment. Causation, and therefore explanation, is sought within the set of relations comprising the system itself, and the law-like results of this approach can be used to account for the prior history and future states of the system provided relevant data are available. Evolution theory, by contrast, is mainly concerned with diachronic relations--with the way prior states of a system determine its present structure and functioning. In this view, causation and explanation are sought in law-like relations obtaining for trains of events, for successive states of the system.

Proponents of the synchronic view, like the philosopher K. Popper and the social anthropologist A. R. Radcliffe-Brown, deny the existence of diachronic laws, asserting instead that the proper interest of historical reconstruction is the specific event. When this case is made in reductionist terms, as it is by Popper, each event is said to have causes that explain it, but there are no laws connecting these causes in regular temporal sequences. Hence, timeless generalizations pertaining to specific categories of events are the basis of historical explanation. Historical inquiry can illustrate the workings of these laws; but, being particularistic, it cannot discover them or laws of any other sort. Historicists, arguing somewhat holistically along lines suggested by J. S. Mill, regard synchronic laws as derivative corollaries of diachronic laws that do control the succession of systemic states. Indeed, it is one of the purposes of social science to discover the laws according to which earlier states of society produce later ones.

Many holists tend to disregard this distinction and the dispute that goes with it. H. Spencer, for example, explained the presence of chiefs in groups having more than a hundred members both synchronically as a function or organizational necessity and diachronically as the result of an evolutionary law by which all systems move from homogeneous to heterogeneous or differentiated states. Dewey made similar arguments to explain specific psychological functions as systemic necessities at any given time and as evolutionary effects of on-going adaptation. Levi-Strauss regarded the two approaches as complementary ways of doing the same sort of thing. Behind such views is an argument offered early in the 18th century by G. W. Leibnitz that simultaneous and successive causation are continuous. The separateness or independence of things is, in causal terms, illusory at any moment and over time; the universe is an interrelated unit and must be explained as such. The resemblance between this line of reasoning and the claims of both Holism 1 and the strong form of Holism 3 is evident.

The concern with relations in the study of human behavior takes yet another form in Gestalt psychology, developed by M. Wertheimer, W. Kohler and K. Koffka after 1910. Gestalts are mental unities which represent experienced objects and situations as wholes rather than as collections of separate elements. Perception, for example, is not a mechanical response of sensory receptors to the separate properties of elements comprising a stimulus object or situation: The same elements (say, two spatially separated flashing lights) will be differently perceived (as one light moving between two points, or as two lights flashing successively) depending upon their own relations (like the time interval between flashes) and relations internal to the perceiver (like the coordination of responses of different receptors with each other and with experientially based conceptions). On these grounds, and in keeping with Holism 1, Gestaltists argue that any psychological process must be understood as a rleationship of reciprocal influences holding between relations internal to persons and to the objects or situations they experience. Having formed a concept to deal with this matter, Gestaltists manifest at least the mild form of Holism 3.

Such are Phillips' main examples of holistic thought in the social sciences. Certainly his survey is not exhaustive, even when the many cases he mentions in passing or in notes are added to those he examines in detail. But Phillips is, after all, operating as a philosopher interested in the forms and uses of arguments. Typification and criticism, not exhaustiveness, are his goals. Having reviewed his examples, we can turn to his critique.

PHILLIPS' CRITIQUE

Phillips' contention that holism can't work rests on three lines of argument. First, the holists are wrong to suppose that an object can only be understood when all of its properties are known. Second, this supposition has led holists to misconstrue the concerns and capabilities of analysis, mechanism and reductionism with respect to complex entities. Third, the same erroneous supposition admits logical absurdities into holism that deprive it of a method and of the advantages it claims over mechanistic analysis and reductionism. The bases for these claims warrant review.

During the nineteenth century it was common to speak about the "nature" of a thing, as if things had absolute identities that were determined by all of their properties. It was on this basis that holists, particularly the organicists, saw differences of identity in differences of even a single relational property. By contrast, twentieth century discussions of such matters tend to distinguish between the defining and accompanying properties of things. Defining properties grant identity to an object, allowing it to be recognized for what it is. Accompanying properties may be present or absent without altering the identity and recognizability of a thing. Since it is possible for relational attributes to be accompanying rather than defining properties, a thing can retain its identity while being observed apart from the full panoply of its possible relationships. This lends much practical legitimacy to the method of analysis and to explanatory doctrines that depend on it.

The widespread acceptance of this distinction since 1950 reflects the influence of Wittgenstein's ideas about how we use terms to characterize things. A term refers to a cluster or family of characteristics only some of which need be present in a thing for the term to be applied to it. It is the cluster which is defining, and the presence of even different subsets of its elements in several objects allows all of them to be called by the same term. This amounts to classifying nonidentical objects as alike--a decisively analytic move that assigns identity to things apart from the full set of their properties. But since objects classified according to some of their attributes do not lose the rest of their traits merely by virtue of being grouped together, we have here a way of discovering the whole range of characteristics--including the relational properties--possessed by the members of a given class. Because this applies to complex entities, the relational concerns of holism are not lost, and an orderly basis for generalizing about classes of things is gained.

Twentieth century holists, particularly proponents of GST, have continued to suppose that a thing can only be understood when all of its properties are known. Accordingly, they have persisted in the rejection of any method or doctrine that attempts to separate objects for closer study. In Phillips' view, this amounts to a misreading of the concerns and capabilities of analysis, mechanism and reductionism.

Analysis does attempt to examine the parts of complex systems separately in order to discover their properties in isolation. But the separating is not done to ignore the whole, which must be taken to exist by anyone who bothers to separate its parts. Rather, it is done to identify the defining features of objects serving as parts and to determine values for them which can be assigned as initial conditions to variables specified in laws. Laws express the general form of relationships between defining properties of classes of objects. Hence, they provide a basis for deducing hypotheses about specific relationships between specific objects which can be either explanatory or predictive depending upon whether they refer to phenomena that are already known or yet to be observed. In either case, the hypotheses deal with relationships which are, presumably, not different from the relational properties that Holism 1 invokes to explain the emergent characteristics of wholes.

Analysis, then, is a method of gathering data that is meant to be used with laws to account for systemic phenomena. Mechanism is an allied explanatory doctrine that attempts to identify these laws in relationships holding among the physicochemical properties of basic entities and the forces operating upon them. It then proposes to account for more complex or higher order phenomena by showing them to be combinations of these same basic entities and forces that come together according to the same fundamental laws. There is no lack of concern with complex entities, but an effort to explain them.

Reductionism, another explanatory doctrine, attempts to show that law-like statements referring to complex entities can be reduced to--i.e., deduced from--laws pertaining to fundamentals. The "fundamentals" need not be the basic entities and forces of physics and chemistry, as in mechanism, though they may be. Rather, they must be things possessed of characteristics sufficient to effect events. So, for example, reductionists might insist that law-like statements referring directly to a complex phenomenon like acculturation can be reduced to laws of individual behavior because it is people with different habits, not cultures as such, whose interactions effect the process. Significantly, reductionists do not necessarily deny the existence of irreducible facts about complex phenomena, nor do they object to their inclusion in explanations. Instead, they place these facts in the minor premises of arguments that have laws about fundamentals as their major premises. It is the purpose of these arguments to deduce such regularities as have been observed for complex phenomena, not to ignore them.

In sum, analytic method and the explanatory doctrines of mechanism and reductionism are plainly concerned with complex entities. They have also been able to deal with such entities effectively. As examples, Phillips points to the behavior of gases, electrical fields, thermodynamic events, and genetic inheritance. All are complex phenomena, and all have come to be understood through analysis, mechanism or reductionism despite the frequent claims of holists that this could not be done. So, Phillips argues, there is no reason to believe that in principle these approaches will not continue to solve problems which seem beyond us at present--even problems of the sort that holists claim only their approach can handle.

To present the absurdity contained in holism, Phillips invokes an argument advanced by William James and Bertrand Russell against the Hegelian doctrine of internal relations: If all things are related, and if relational properties must be known for a thing to be understood, then we must know everything in order to know something. Hence, we can never know anything at all. Let us examine this point further.

Suppose we wish to understand a complex entity E composed of three elements A, B and C. According to Holism 1, E emerges from the relational properties of its elements. Hence, it is pointless to examine A, B and C seperately because the relational properties of these elements will be missed. Nor will it do to examine the subsidiary combinations AB, AC, and BC since AB is affected by C, AC by B, and BC by A. In effect, nothing will do to understand E save understanding ABC. But this is the same as saying that E can only be understood by understanding E, a fully circular argument.

In order to break this circle, some holists grant that elements and subsidiary combinations may usefully be studied as a way of determining the relational properties needed to explain emergent characteristics--so long as the latter are the primary objects of inquiry. But this is, as we have seen, what analysts, mechanists and reductionists do when they treat relational properties as initial conditions to deductive arguments that account for the same sorts of phenomena. To make this concession, is to grant that holism has no method of its own--it must resort to analysis to get data--and that it lacks the advantages claimed for it regarding the explanation of complex entities.

Proponents of Holism 2 attempt to avoid these difficulties by constructing the explanatory problem differently. The goal is not to explain E in terms of the relational properties of A, B and C. Rather, it is to explain these properties by appeal to the principles according to which the organizational power of E operate. But this supposes that E itself can be isolated from the yet more complex systems to which it belongs. Mechanists and reductionists do make this analytic assumption, but serious holists cannot without violating an essential premise of their position. If all things are related, and E is a thing, then it must have relational properties that are necessarily missed when it is examined in isolation. Again, either everything must be known in order for anything to be understood, or holism has no way of working that isn't used by those it attacks.

The strong form of Holism 3, being an extension of Holism 1 and 2, has much the same difficulties. But, because it is presented as a call for conceptual reform, it includes an additional source of trouble. If the images invoked by Holism 3 are purely conceptual, they can hardly be said to have physical powers of organizaiton. At some point, reference must be made to real things. But if real things really are embedded in a hierarchy of relationships, then none of them can be understood outside of the whole to which they belong--which is to say, again, that the entirety of nature must be known before its parts can be understood. The mild form of Holism 3 escapes these problems by granting the legitimacy of employing analytic, mechanist and reductionistic strategies in the empirical pursuit of holistic conceptions. But this, of course, is only to grant again that holism as such has no way of working of its own and no advantages over analysis, mechanism and reductionism.

Virtually all of the uses of holism in social science must fall by the same arguments: Dewey is compelled to grant the usefulness of information about individual objects. Neither Durkheim nor Mandelbaum can reject reductionism logically by arguments that require the very sorts of information from which reductionists can also deduce emergent social phenomena. GST is unable to specify its subject matter and make predictions about it without engaging in the same separations of objects that its central premise rejects. Holistic versions of structuralism, functionalism, historicism and Gestaltism are in the same boat. All of them must either be immobilized by their assumptions or resort to analysis and do what their opponents do too.

Plainly, Phillips' critique is an espousal of the positions that holism rejects. Holism has solved no problems not solved as well by analysis, mechanism and reductionism; and problems that did for a time resist solution by the latter approaches also eluded holism. In this sense, holism is as unnecessary as it is unworkable--holists must either resort to analysis or accept the absurdity of needing to know everything in order to know anything.

In a postscript, Phillips briefly identifies those features of holism which remain acceptable under his critique: The holists have raised pertinent questions about ways of investigating organic wholes and about the effects of analytic decomposition upon such inquiries. They have rightly called attention to the importance of dynamic relations between parts and to the difficulties of predicting the emergent properties of wholes. And they have been right to call for the development in science of concepts referring to wholes.

These are substantial concessions. But Phillips grants them, taking his critique to have dismissed those points of holism which are antithetical to traditional science--the rejection of analysis, mechanism and reductionism; the ideas that the whole determines the nature of its parts and that the nature or identity of an object consists of all of its attributes, including all of its relational properties; and the call for a total reconceptualization of nature in holistic terms. In his view, what is left when these points are gone is safe.

REJOINDER

Phillips' critique can be answered in ways that argue for the continued use of holism both generally and as a justification of interdisciplinary work.

The critique brings three charges against the central holistic idea that all of an object's attributes must be known for it to be identified and understood: (1) The idea is unwarranted in view of the distinction between defining and accompanying properties. (2) It is therefore not a sound basis for doubting analysis, mechanism and reductionism as ways of studying wholes. (3) Given the companion claim that wholes determine the nature of their parts, the idea leads to absurdities--to circularity and either to the contradiction of accepting analysis or to the impossible situation of needing to know everything in order to know anything.

To answer these arguments we shall have to show that the challenged idea is in some sense necessary, that it does give holists a proper basis for their doubts, and that it need not lead to absurdity. Our claims can best be developed in the light of Phillips' charges.

He argues first that objects can be recognized in different contexts because some of their properties are fundamentally unaltered by movement in and out of particular relationships. Inquiry and explanation can proceed on the basis of these defining properties without full knowledge of all the accompanying characteristics an object can get from relationships in various contexts. The holists are consequently wrong to insist that all the properties of an object must be known for it to be identified and understood.

But nothing in this argument denies that an object's relational properties must be known for it to be identified as a part of some whole. By themselves, the properties of objects which are not altered by relationships provide little information about the properties which are. The traits which identify a person as a man in any context do not indicate whether he is an American in Boston or an American in Paris. While traits of the latter sort may only be accompanying attributes, they serve to specify the sense in which an object is part of some whole. In this limited way, at least, the holist's claim contains an element of necessity even if its global form is wrong.

Phillips argues next that the holists are wrong to doubt the concerns and capabilities of analysis, mechanism and reductionism with respect to the study of wholes. Analysts do seek the properties of objects in isolation, but only in order to specify the initial conditions for arguments using laws to identify parts and to account for wholes. Mechanists seek laws about basic objects and forces which, along with analytic data, can explain the composition of wholes. Reductionists attempt to show that the properties of wholes can be deduced from the properties of their parts and laws pertaining to their interactions. In these respects, holism is not only wrong--it is unnecessary.

These arguments do indicate attention to wholes. But if it is attention not focused on relational properties, it must surely produce understandings rather different from those entertained by holists. Either this or the attending analysts, mechanists and reductionists must be tacitly accepting tenets of holism that Phillips rejects.

Insofar as analysis seeks the isolable properties of objects, it cannot be regarded as providing information about their relational properties. The seeking itself is certainly in line with the main purposes of analysis--describing a system's initial conditions in order to determine (1) the identity of its unknown components by showing that they behave like objects specified in laws, or (2) the applicability of laws by showing that they correctly represent the behavior of system components which are known to be like the objects they mention. Such purposes require knowledge of isolable properties because it is in terms of them that objects are identified or defined in laws. It is true, of course, that these properties affect the relational characteristics that objects acquire in given contexts. But it is likewise true that isolable properties, being independent of particular contexts, are different from relational properties which are context-dependent.

These points about the analytic study of objects as system components pertain as well to the study of systems as such. The analysis of a system requires it to be isolated--unaffected by factors not being considered explicitly. Without isolation it cannot be told whether factors identified in laws are those responsible for the system's observed behavior. This is why analysts invoke assumptions like *ceteris paribus* or *mutatis mutandis* and try to control their subject matters by physical or statistical means. It is partly because holists doubt that an object or system can be both isolated and known that they question the effectiveness of analytic method. But their larger doubts are based on the idea that the analytic search for properties in isolation leads away from relational properties.

It would be wrong, however, to insist that there is no way of using analytic methods to discover the relational properties of parts. By systematically observing an object in different contexts, we can determine which of its characteristics remain the same and which alter, hence which define its identity as a separable object and which define its identity as a part of each context. In effect, contexts are used as independent variables in an essentially descriptive process of inquiry.

Admittedly, this procedure is not analysis in the usual sense because it involves no laws. But it does use the analytic method of manipulating some variables to see how others behave, and it does lead to knowledge of the isolable properties of objects. That it also yields knowledge of relational properties must be counted as something of an advantage. However, to gain this advantage it is necessary to regard the contexts or independent variables as wholes and to know them fully in advance. Otherwise we should not be entitled to treat the altering properties of objects as relational properties of parts, and we should not be able to specify the contextual differences involved.

Accepting these conditions amounts to accepting at least one of two holistic tenets which Phillips rejects--that wholes (the differing observational contexts) determine the relational properties of their parts, and that the whole must be known for its parts to be understood. Regarding the first tenet it may be objected that, since it is not the whole but only some of its properties that are varied in order to create differing observational contexts, it is not the whole which determines. To raise this objection, however, is to invoke the second tenet by claiming knowledge of the whole--in this case, that it has specific properties which can vary while the rest remain constant.

Phillips circumvents these issues--the analytic emphasis on properties in isolation, and the tacit acceptance of unwanted tenets--by placing relational properties in the province of laws. Laws do state the forms of relationships holding bertween properties of objects. But since these forms must remain the same in different contexts in order to be law-like, it is reasonable to question whether they can always be found for relational properties which are context-dependent. This question can be raised about the use of laws in both mechanist and reductionist treatments of wholes.

Mechanist laws express the regular forms of relationships between defining properties of basic entities and the forces which affect them. The entities mentioned are basic in the sense of being elementary units from which a wide variety of things more complex than themselves are made. Their properties must be defining in the sense of being stable enough to permit entities of the same class to be recognized in different contexts. The forms of relationships between these properties must be regular in the sense of remaining the same in different contexts. The specific values of these properties, like the values of forces operating upon them, vary with surrounding conditions. But the categories of properties and the forms of their relations must remain the same in all contexts if information about them is to have explanatory significance.

It is the apparent restriction of mechanistic laws to defining properties and fixed relationships which brings holists to doubt their appropriateness for the study of wholes. The parts of complex systems, even when they are basic entities, display properties that are not among the defining attributes assigned to them in mechanistic laws and that are consequently not covered by the relationships advanced in such laws. Holists address this matter by supposing that objects, even basic entities, acquire properties from their association with each other where "association" refers not only to the collection of objects present but also to the manner in which they are organized. These are relational properties, of course, and it is because they do not always appear in mechanistic laws that holists have doubts.

Phillips doesn't dismiss this matter. Rather he considers it in terms of two tenets of holism which he takes to be fully compatible with mechanism--that concepts of wholes facilitate discussion of the properties of complex systems, and that the parts of a whole are dynamically interdependent. Thus, confronted with properties not anticipated in the laws they are using to examine a system, mechanists ordinarily suppose that a more complex theory is needed. Such theories are constructed so as to take more variables into account. Fundamentally, the system is reconceptualized to include more entities, hence more interdependencies affecting its operations. This move is rather like the holistic strategy of treating one whole as part of another. For it to remain fully mechanistic, the additional variables must still be defining properties of basic entities with law-like relations from which the problematic properties can be deduced. Otherwise it would be just as plausible to argue, as holists do, that associations between basics impart relational properties to them which are different from the properties mechanists take to be defining.

It is wrong to argue, as some holists do, that the mechanistic approach to this matter is in principle impossible. As we have seen, Phillips is able to point to cases in which it succeeded. But these successes are likewise no basis for claiming in principle either that the mechanistic approach will always succeed or that the holists must abandon their alternative approach. Rather, it would seem, the holists are entitled to their alternative and to their doubts--the first because mechanists come very close to using it in their own approach; the second because mechanistic laws are not designed to take context-dependent relational properties into account directly.

A somewhat similar point applies to the reductionist claim that the properties of wholes can be explained by deducing them from the properties of parts pertaining to their interaction. If the term "parts" is taken literally, this claim suggests that the premises of reductionist explanations must include information about relational properties. Such information could certainly be placed in statements of initial conditions. But since initial conditions specify the values of variables identified in laws, the interaction laws would then have to contain terms for relational properties. Moreover, in order to be laws, they would have to express forms of relationships holding between these properties across contexts.

What holists may reasonably doubt in this approach is the idea that law-like propositions holding across contexts can always be formulated for relational properties which are context-dependent. Again, this doubt should not be held as a matter of fixed principle since some relational properties, like distance in gravitational systems, are regular enough to be handled in this way. But the doubt is not unfounded when dealing with objects much affected by their contexts. Holists deal with this matter by taking context into account explicitly--by treating the whole as context to its parts and supposing it to have properties of an organizational nature that affect them. But this option is closed to reductionists insofar as their program requires deducing wholes from the properties of their parts. With respect to this requirement, at least, holists are entitled to their doubts about reductionism.

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Nothing in these arguments denies the value of mechanistic analysis and reductionism as ways of investigating and explaining natural phenomena. Rather the arguments assert that because these approaches are concentrated upon properties of objects which either remain the same or vary determinately across contexts, they do not always deal effectively with context-dependent characteristics. It is with respect to their focus on defining properties that laws advanced by mechanists and reductionists differ from those suggested in holistic versions of structuralism and functionalism. In effect, holists emphasize the fact that objects identified as the same in terms of their defining properties can display altogether different relational properties depending upon how they are organized. This emphasis does imply that the organizational characteristics of wholes determine the relational properties of objects considered as parts. And the implication does lead directly to the claim of absurdity.

The charge of absurdity asserts that two tenets of holism--wholes determine the nature of their parts, parts are identified by their relational properties--lead to circularity and either to the contradiction of accepting analysis or to the impossible situation of needing to know everything in order to know anything.

The tenets are held to be circular because they can be taken to mean that the whole determines itself. This interpretation follows from the claim that "whole" and "nature of its parts" are the same things. More specifically, "whole" refers to the full set of relations obtaining among the objects which are its parts; and "nature of its parts" refers to those properties of objects which, deriving from their relations with each other, identify them as parts. By these definitions, a whole is not itself without all of its parts, and no object is a part without the relational properties it gets from the whole. Accordingly, "whole" and "nature of its parts" refer to the same things and the tenets assert the circular argument that the whole determines itself.

A different interpretation is possible, however. To begin with, insofar as "nature of its parts" refers specifically to the relational properties of objects determined by the whole, the reference need not be taken to imply that such objects have no other properties--properties that are not determined by the whole but that do influence what relational properties the whole can effect. In this sense, the whole does determine the nature of its parts, but it does not completely determine itself.

Consider, for example, a barnyard population of hens which, as a whole, is arranged into a dominance hierarchy. The whole need not be seen as determining all the properties of each bird which make each a hen. It need only be seen as determining the relational property of position in the hierarchy that each bird has. In this sense, the whole does determine the relational properties or "nature" of its parts. But insofar as the parts have properties affecting their "natures" that are not determined by the whole--as being a hen affects inclusion in the hierarchy without being determined by it--the whole does not determine itself.

It is true that the relational properties of all the parts must be known if the whole is to be specified or known. This may seem to constitute a circle insofar as "whole" and "relational properties of all the parts" are taken to refer to the same things. But it must be recognized as well that the whole has properties not possessed by any of its parts. Specifically, the whole has organizational characteristics that are not identical to the relational properties of any of its parts.

Suppose, for example, that our dominance hierarchy of hens is organized so as to be completely transitive and irreversible. We may say of this organization, in purely formal terms, that one of its members must dominate all the others, that one must dominate none of the others, that each of its remaining members must dominate some but not all of the others, that none of its members may dominate its dominator or its dominator's dominator and so on. While it is true that every hen in the population must have some relational properties corresponding to these characteristics of the whole, it is also true that no member has all of them. In this sense, "whole" and "relational properties of all the parts" do not refer to the same things.

By dealing with particular wholes, these arguments and examples may seem to beg the larger questions embedded in the charge of absurdity: If the whole determines the nature of its parts, and the entirety of nature is itself a whole, then parts can hardly be said to have properties not determined by the whole--unless we wish to invoke extra-natural causes. This is so, but it is also true that the whole of nature has organizational characteristics not possessed by any of its parts. Thus, even in this extreme case, holism need not be regarded as completely circular in that "whole" and "nature of its parts" do not refer to the same things.

But even if holism isn't circular, its commitment to the image of nature as a whole brings the "contradiction" and "impossibility" issues to bear: If nature is a whole, then the study of any of its parts by itself--for example, the study of a particular whole--amounts to acceptance of the analytic strategy of examining objects in isolation. Holists reject this strategy because it deprives parts of relational properties which must be known if the whole is to be understood. The study of particular wholes therefore contradicts the grounds on which holists reject analysis.

Holists do single out and investigate particular wholes. But it is not clear that in doing so they either accept analysis or contradict the grounds on which they reject it. For one thing, holists need not accept the analytically necessary practice of identifying their subject matters by likening them to objects specified in laws. We have already seen why, according to Phillips, analysts must do this. By contrast, holists may identify their subject matters conceptually, as Phillips approvingly indicates that Easton did by likening political life to the concept of an

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open system. Or they may do this empirically on the basis of practical experience with complex systems, as Phillips indicates rather less approvingly that Weiss did. Neither of these approaches is bound to suppose that the systems they single out for study exist or operate apart from the contexts in which they occur. For neither is primarily bent upon using laws in the mechanist or reductionist manner to identify and explain their subject matters. In this sense, the "singling out" of holism is not tantamount to accepting the "isolation" of analysis.

Nor do holists investigating a particular whole have to accept analytic procedures as a suitable way of delineating the relational properties of its parts. Analysts proceed by manipulating or controlling some variables to see how others behave, where the variables are values of defining properties of objects specified in laws. Their results are statements about the form and extent of covariation between some properties of some objects. Such statements do provide a basis for determining whether the observed covariations are like those posited in laws. But they do not necessarily give information sufficient to determine the relational properties of objects considered as parts. The latter, being context-dependent, may not even be mentioned in laws, and they are in any case derived from a part's association with all (not one or another) of the other parts arranged in a particular way.

So, to return to our barnyard example, the relational property of position in the hierarchy can only be stated for a given hen in terms of her dominance relations with all the others. Thus, in order to say that a hen is the eighth in a population of seventeen, we must observe that she is dominated by seven others, that she dominates nine others, and that the two sets have no members in common. Indeed, since the hierarchy itself cannot be specified until the dominance relations of each hen with every other one are known, it is necessary to have observations similar in form for every hen. Statements reporting such observations identify a property for each hen that is her relation to every other hen in the context under study. They are in this sense different from analytic statements reporting covariations between some properties of some objects which can have the same form in different contexts.

It is true that formal analytic questions pertaining to the whole are possible. So, we can usefully ask whether position varies with size or age; or whether dominance position observed for one behavior, say feeding, holds for other activities like breeding; or whether position correlates with particular conditions like health of the member or survival rate and dominance position of her chicks, etc. But it is equally clear that such questions make no sense apart from prior knowledge of the whole. Statements reporting the relational properties of each hen are a basis for making inferences about the organizational characteristics of the whole population. Statements about the organization of the whole do contain implications about the properties of its parts, including some that can be analytically ascertained. But neither sort of statement is based entirely on information of the kind that analysis ordinarily provides. And since they are of logically different types, the statements are not circular.

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Even if holists need not accept analytic means of identifying and investigating particular wholes, they may be seen as engaging in contradiction insofar as they study particular wholes at all: If the entirety of nature is a whole, then to study any particular whole by itself is to study a part without reference to its relational properties. This is the very practice for which holists reject analysis.

Holists would be engaging in this contradictory practice if they treated knowledge of a particular whole as an adequate basis for understanding it as part of some other whole. That holists do not do this is perhaps best indicated by the fact that Phillips criticizes them severely for doing the opposite--for insisting that knowledge of an object's properties in isolation is not sufficient to predict the properties it will acquire upon entering relationships with other entities. The criticism is telling since such predictions can sometimes be made: Phillips cites, for example, predictions about the properties of materials under as yet unobserved conditions. But there are also significant instances in which such predictions cannot be made, as when the evolutionary consequences of a species' entry into a new environment cannot be fully anticipated, even when a great deal is known about each term separately. This sort of difficulty, which Phillips acknowledges in his concessions, suggests that the holists have at least got a point. By insisting upon it, they avoid practicing what they preach against themselves.

This line of argument can be used to answer the charge that by rejecting analysis holism accepts the impossible requirement of needing to know everything in order to know anything. In effect, holists need not deny that knowledge of objects in isolation, including knowledge of particular wholes, is knowledge of something. Rather, they must assert that such knowledge is an inadequate basis for knowing objects as parts because it lacks information about the relational properties they get from inclusion within a whole. The process of acquiring this sort of information is as sequential and therefore as possible as any other process of inquiry. What holists maintain about this process is that its constituent steps do not produce settled information. What is earlier known is subject to modification by what is later found out--sometimes because the earlier information was wrong; always because it was incomplete.

We may see this matter more clearly by adapting one of Phillips' points. In discussing methodological individualism he notes that it must always have more advantages than holism. While individualists regard holism as an insufficient basis for explaining social phenomena, they can both accept its findings and then attempt to reduce them to fundamentals. These advantages press toward simplicty and generality. What we have been suggesting about holism is that it has similar advantages in the oppostie direction. Holists regard analysis as an insufficient basis for understanding objects as parts. But they can certainly accept its data and their own findings about particular wholes as information relevant to the question of what relational properties objects can have as parts. Given this information, holists can then attempt to discover how the objects in question are affected by their incorporation into wholes. These advantages press toward complexity and completeness. They are as many and as valuable as the advantages of reductionism, and they are as possible to pursue--if it is realized that the pursuit is sequential and qualified by the understanding that even knowledge of particular wholes is incomplete insofar as it is gathered without reference to their status as parts of other wholes.

So long a rejoinder needs summary of its main points. There are five:

1. Holists may have been wrong, or at least overzealous, to equate an object's identity with all of its properties. But they are right to insist that the relational properties of an object must be known for it to be identified as a part of some particular whole.

2. Holists may have been wrong to insist that analysis, mechanism and reductionism cannot contribute to the understanding of complex entities. But they are right to maintain that these approaches, being focused on the law-like behavior of basic or fundamental entities in different contexts, are not apt to produce information about relational properties in given contexts--information that is needed to identify objects as parts and to make inferences about the organizational characteristics of wholes.

3. Holism is not absurd in the sense of being circular. The idea that the whole determines the nature of its parts need not be equated with the circular claim that the whole determines itself. The key terms "whole" and "nature of its parts" do not refer to the same things: Wholes have properties not possessed by any of their parts. Objects have attributes other than the relational properties which identify them as parts of a particular whole--attributes which are not themselves determined by that whole but which do influence what relational properties the whole can effect.

4. Holism is not absurd in the sense of contradicting itself by rejecting analysis and then using it in the study of particular wholes. Where analysts must use laws to identify their subject matters, holists may use conceptual schemes or practical experience. Where analysts proceed by manipulating some variables to see how others behave, holists proceed by describing the relational properties of each part in terms of its association with all the others. Where analysts assert, holists deny that knowledge of any object's properties in isolation can account for its properties as a part of some whole.

5. Holism is not absurd in the sense of being impossible to use. Since it is not contradictory for holists to study particular wholes, their doctrine does not entail the unworkable view that everything must be known for anything to be known. Holists can grant that knowledge of a particular whole is knowledge of something. However, they must insist that this knowledge is partial or incomplete insofar as it lacks information about the relational properties that whole would acquire as part of some other whole. In this sense, holism does not impede the

acquisition of knowledge. Rather, it warns about the nature of the knowledge we may have at any point.

CONCLUSION

The form of holism which emerges from this discussion is less sweeping than the one which Phillips attacks. This reflects the fact that his arguments are well-wrought and telling. Nevertheless, our version retains some important points of holism which Phillips would dismiss, and it does tie these points to features of the doctrine which he accepts. It is in this sense that our version supports the continued use of holism, not as an adjunct to analysis, mechanism and reductionism, but as a discinctive and useful approach to science in its own right.

One characteristic of this approach--its opposition to the use of partial knowledge as if it were complete--is particularly relevant to the justification of interdisciplinary work. We can consider this matter briefly by way of closing.

It may be said, of course, that the opposition is truistic. More is the wonder, then, that we so often act to the contrary by using avowedly partial knowledge as a basis for acting toward wholes. In the social sciences, for example, human lifeways are commonly regarded as far too complex to be studied as intact wholes. This view is embodied in the practice of specialized disciplines that investigate various aspects of human activity separately. Few specialists deny that the results of their efforts are necessarily partial. But few also act as if what they know about aspects of behavior examined separately would be markedly different were those aspects to be examined together in the context of particular wholes.

Holists have no special reason to reject the practice of disciplines, and it is not surprising that major figures like Durkheim, Levi-Strauss and Piaget are associated with specific fields. But given their views on the importance of relational properties, holists do have reason to doubt that what is known about aspects of behavior taken separately would remain the same were they taken together. It is in this sense that holism helps to justify interdisciplinary work in the social sciences--work which has as its central purpose the discovery of relations among aspects of behavior that are usually studied separately in different disciplines.

The holistic approach to interdisciplinary work involves more than the study of interactions among various aspects of behavior. To be sure, the notion of relational properties assumes that interacting objects affect each other and bring about consequences not attributable to the objects taken separately. But holism calls attention as well to matters of organization--to the idea that interactions may be as much affected by the way that interacting objects are arranged as by what they happen to be. This puts a premium upon communication among interdisciplinarians working on altogether different phenomena: Concepts of organization may be highly transportable across subject matter domains. They may consequently call attention to factors affecting interactions that a substantive or topical approach to interactions may overlook.

Occasions for interdisciplinarians to talk with each other because they are interdisciplinarians, rather than because they have common topical interests, are as yet rare. Groups which generate such occasions, like the Association for Integrative Studies, are thus not just welcome--they are needed.

INTERDISCIPLINARY THEORY AND AMBIGUOUS FORM PERCEPTION

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A satisfactory theory of interdisciplinary study must explain how the brain employs interpretive frameworks, "disciplines," or "particular styles of knowing" to organize information or "reveal something about its objects of study." Visual illusions, the kind of pictures and geometric forms which spontaneously shift their principle aspect when they are looked at steadily, may be useful in developing such an explanation. "Although several visual illusions were known to the ancient Greeks, they have been studied experimentally for only little more than a century."[1] Swiss naturalist L. A. Necker first described such illusions scientifically in a letter of 1832 to physicist David Brewster. In this letter Necker described a cube which reverses in depth either through changes of eye fixation or otherwise quite spontaneously. Such effects were found not to be perceptual distortions of retinal images, but rather "alternative interpretations of the image in terms of possible objects."[2]

When one looks at a "Necker Cube," first one of its faces seems to be at front and the other at back. Then, as one looks steadily at the drawing for a while, it suddenly reverses and what was the back face becomes the front one. This phenomenon does not occur with all drawings of cubes but rather only with those which are ambiguous or "multistable" forms. When we look steadily at a picture or geometric figure, the information received by the retina of the eye is relatively constant and what the brain perceives usually does not change. If, however, the figure we are viewing is an ambiguous or "multistable" form, what the brain perceives may change rapidly without any change in the message it is receiving from the eye.[3] The classic demonstration of this phenomenon was introduced by Danish psychologist Edgar Rubin in his 1915 monograph dealing with visually perceived form as a function of the relation of figure to ground. In this work Rubin presented the "reversible goblet," a white-on black silhouette which can be seen either as a white goblet on a black field or two black profiles facing each other on a white field.

It is believed ambiguous figures of this kind provide the viewer with a sensory input for which there are within the brain two or more possible representational systems that are quite different and about equally good by whatever criteria the perceptual system employs. When alternative representations or descriptions of input are about equally good, the perceptual system will adopt sometimes one and sometimes another. Such perceptions are termed "multistable" and they have their counterparts in the physical world. For example, the multivibrator flip-flop circuit in vacuum tubes or transistors displays multistability in electronic circuitry.[4]

Reversible figure-ground designs appeared as early in the work of the late Dutch graphic artist Maurits C. Escher as 1921 when he was 23 years old. Escher's own commentary on his prints make it clear he was familiar with the experiments on figure-ground perception conducted by Edgar Rubin, together with Kurt Koffka's book *Principles of Gestalt Psychology* which summarized Rubin's results, and studies conducted by Molly R. Harrower, Koffka's student. In 1922, Escher carved a woodcut called "Eight Heads" based on principles of figure-ground reversal. In this work, each head exactly fills the space left between neighboring heads and acts alternately as figure and ground, depending on the viewer's attitude. Escher classified "Eight Heads" together with the later works "Sky and Water I" and Day and Night" under the heading "The Function of Figures as Background," observing that "Our eyes are accustomed to fixing on a specific object. The moment this happens everything around becomes reduced to background."[5] This description was in keeping with Rubin's analysis of similar figures.

Rubin had observed that usually in ambiguous patterns, one sees the smaller enclosed form as figure by contrast with the larger surrounding expanse of ground. The figure has a "solid-object quality," whereas the ground takes on a "film quality." The figure protrudes and the ground recedes while the contour between the two is seen as belonging to the figure and not the ground.[6] Escher also noted that "the act of tracing (a contour line) is a complicated business. On either side of it, simultaneously, a recognizability takes shape. But the human eye and mind cannot be busy with two things at the same moment, and so there must be a quick and continual jumping from one side to the other. . . ."[7] Contemporary investigators of computer simulation have also observed that it is quite "impossible to see both sides of a contour as figures at the same time. Trying to think of the halves as two pieces of a jigsaw puzzle that fit together does not help; the pieces are still seen alternatively and not simultaneously."[8]

Escher's experiments carried him deeply into studies of the nature of multistability in perception. By 1938, he had created two of his most striking wood-cuts, "Sky and Water I" and "Day and Night." In these works the ground slowly becomes figure and the figure becomes ground while forms in the center remain equivalent in extent, internal design, light-dark contrast, and simplicity of contour. Such equivalence makes the figures ambiguous, and a rapid reversal is

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the result. In appreciating these works one realizes that when a picture can be seen as either of two familiar objects, for example, a duck or a rabbit, visual input is matched immediately in the mind with some kind of acquired or learned schemata of classes of objects. What these schemata consist of--whether they are like composite photographs or like lists of properties--remains a matter of scientific dispute. "In any case the process of identification must involve some kind of matching between the visual impact and a stored schema. If two schemata match the visual input about equally well, they compete for its perceptual interpretation; sometimes one of the objects is seen and sometimes the other. Therefore one reason ambiguity exists is that a single input can be matched to different schemata."[9]

Why one aspect of an ambiguous figure, once it is "locked in" or stabilized in the mind, should ever give way to the other remains a matter of controversy. A person can look for quite a long time at an ambiguous figure and see only one aspect of it. Because on occasion it is not until the other aspect is pointed out that the figure spontaneously alternates, it has been concluded that the initial contact and the associated organization must entail a type of learning.

Under natural conditions ambiguity is rare and many factors co-operate to resolve competiton between rival-object schemata. An enclosed area or smaller area is favored as figure. Elements that are alike are grouped together. Regularities are grouped together. Readily seen figures are usually simple, compact, and symmetrical. A familiar figure is easier to perceive than one which is less familiar.

> The perceptual system has an impressive ability to segregate and sort objects from one another. Along with distinguishing figure from ground, the system must group the fragments of information it received into separate sets that correspond to real objects. . . When alternative groupings are about equally good, ambiguity results.[10]

Some principle of minimum complexity seems to govern the perceptual system in that it is "motivated" to "represent the outside world as economically as possible, within the constraints of the input received and the limitations of 'encoding capabilities."[11] Input corresponds to a schema that is already "well established by experience and can therefore be encoded or described. . . most simply in terms of that schema."[12] A schema therefore may be a "world view" though all schema need not be world views. A schema differs from a "perceptual screen" in that it constrains interpretation rather than perceptual input itself. The system is designed to find its way to stable states that are simplest by several criteria. According to investigators, a reversing figure alternates more rapidly the longer that it is looked at. Possibly when one schema becomes "fatigued" or "satiated" or "adapted," it is overcome by its more fresh and exciting alternative. Electronic circuits manifest this characteristic. "However, if the representational system reflects the laws of the world it represents, the same object cannot

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traverse two different paths simultaneously or occupy two different places at once."[13]

Perception, then, seems to involve associating learned or herditary given information with input. As one researcher describes it:

> Perception seems to be a matter of looking up information that has been stored about objects and how they behave in various situations. The (input) does little more than select the relevant stored data. This selection is rather like looking up entries in an encyclopedia: behavior is determined by the contents of the entry rather than by the stimulus that provoked the search. We can think of perception as being essentially the selection of the most appropriate stored hypothesis according to current sensory data.[14]

Such a "look up" system would be of superb survival value to a living creature. Instead of having to rely on a control system that must wait to respond until enough input has been acquired, a creature with stored up information can continue to act in the temporary absence of relevant information or even when information is inadequate. Unfortunately, however, this very strength can become a danger for it means such a creature could continue to function even in ignorance.

These characteristics of perceptual systems have exciting implications for those seeking to understand relationships between "disciplinary" and "interdisciplinary" thinking. It is possible to think of many kinds of learning in a sense as intricate acts of perception. From this point of view, a problem for study might be thought of as a kind of informational "input" which the mind makes sense of by using any one of a number of learned available representational systems or "disciplines." In simple cases, input matches system and one studies the problem in a "disciplinary" way. In more complex cases, input or problem may match equally well with more than one good system of representation or "discipline." These are the situations we have tended to call "interdisciplinary" in that there seems to be more than one good way to represent the same material. If Escher and others are correct, however, it would appear more accurate to call such situations "multi-disciplinary" for there could be no informational input processed simultaneously by two disciplines or representational systems any more than it is possible to perceive both an ambiguous figure image and a ground image simultaneously. Rather, given a complex problem it is reasonable to assume the mind would apply first one schemata or discipline (with borderline input enclosed within that schemata) and then would alternate to apply another discipline or representational system. In the words of one interdisciplinary theorist:

> Most interdisciplinary work begins with a problem that has been addressed by more than one discipline. Once aware of the multiple treatments, the "complete scholar" feels the challenge inherent in the situation. . . . (He) then sets out to demonstrate that (his own expertise is the last word) and to refute the products of other disciplines. . . .Or, (he) finds that his own discipline has falsified the

question; (and he) redefines the subject as one that transcends the boundaries of (his) particular discipline.[15]

In terms of redefinition of a subject, it is important to remember what Escher discovered about the tendency of mind to "lock in" on one way of perceiving a field and to stay with that approach until encouraged to perceive differently. This failure of mind may explain why intelligent men and women may look at the same field--say, urban studies--and perceive only the contribution of their own field to that study to the exclusion of others whereas other perceivers may identify many contributors. In many cases, only one schemata or "discipline" will match a field input, as for example, "photosynthesis" matches "biological studies" much better than "literary studies." However, in other cases, as, for example, the field of "environmental studies," two or more schemata or "disciplines" can be used equally well to separate essential features of study from background. Thinking of the environment as a scientific field pulls certain elements forward and makes others background; thinking of the environment as a political field alters these arrangements as would thinking of the environment as an aesthetic field.

If continued study of a problem reveals it is in essence a "multistable form" in that two or more disciplines can be employed about equally well to reveal something about it, one of a number of consequences become possible theoretically. First, the mind might alternate more and more rapidly between disciplines on an "excitement-exhaustion" cycle and this "multidisciplinary" condition might be as close as one could come to true "interdisciplinarity." Second, unstable conditions may encourage the formation of a new "discipline" which better represents the problem at hand than existing disciplines might. Such a situation might best be called "crossdisciplinary" or "transdisciplinary." And, finally, it is possible that the mind might be able to hold a "neither-and-yet-both" hypothesis however briefly on the problem. To hold two or more schemata in mind simultaneously may be physically impossible. Yet, this condition should perhaps be called truly "interdisciplinary" (in that it exists between disciplines) and also "highest truth" in that only in this situation is the mind liberated from its interpretive screens enough to penetrate to the interconnectedness of all phenomena, to Heraclitus's world of flux, interpenetration, and transformation, to the "orderly disorder" that Escher tried to represent with his art.

Studies of perception would suggest that the way to lead students to consider multidisciplinary, transdisciplinary and interdisciplinary problem solving would be to begin with a multistable or ambiguous problem, apply a discipline until its explanatory powers are exhausted, and then seek engagement of other disciplinary perspectives. In other words, one transcends disciplinary thinking only when one senses that an available schema will not satisfactorily explain a problem. It is important to remember here that the mind appears to have been created in such a way that it acts as if it knows what it is doing even if it does not possess very much information. This characteristic suggests multi- disciplinary perspectives become visible only to those who learn a discipline thoroughly enough to sense its limits and not to those who are less well informed.

It has been suggested that all significant problems--problems with existential force--are multistable forms which transcend disciplinary lines.[15] If this is the case, we need courses and a curricula in our schools which confront students with ambiguous problems demanding rapid shifts between several mental disciplines for their full comprehension. For such minds may be better prepared to confront problems engendered by complex twentieth century living.

NOTES

[1] Richard L. Gregory, "Visual Illusions" in *Readings from "Scientific American": Mind and Behavior* (San Francisco: W. H. Freeman & Company, 1980), p. 95.

[2] *Ibid.*

[3] Fred Attneave, "Multistability in Perception" in *Readings from "Scientific American": Mind and Behavior*_ (San Francisco: W. H. Freeman & Company, 1980), p. 107.

[4] Attneave, p. 116.

[5] Marianne L. Teuber, "Sources of Ambiguity in the Prints of Maurits C. Escher" in *Readings from "Scientific American": Mind and Behavior* (San Francisco: W. H. Freeman & Company, 1980), p. 135.

[6] Teuber, p. 136.

[7] *Ibid.*

[8] Attneave, p. 107.

[9] Attneave, p. 111-2.

[10] Attneave, p. 109.

[11] Attneave, p. 115.

[12] Attneave, p. 114.

[13] Attneave, p. 111.

[14] Gregory, p. 104.

[15] Guy V. Beckwith, unpublished letter, Auburn University, 1984.

WHERE DO IDEAS IN SCIENCE COME FROM?: TEACHING LIGHT AND VISION AS A CASE STUDY

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The belief that the "scientific method" provides a degree of certitude not available in the humanities or social sciences helps to attract many students to careers in engineering. An important goal, then, of an interdisciplinary program at an engineering college is to subject a simplistic notion of the "scientific method" to appropriate scrutiny. The course "Light and Vision" described here attempts to open science, engineering and management studes at WPI to the ideas of writers like Thomas Kuhn and Gerald Holton concerning how ideas and innovations in science arise.

How "Light and Vision" was formulated is perhaps best understood by considering its development in the context of WPI's recent revaluation of its program and goals. In reorganizing its curriculum in the late 1960's, WPI placed a much greater emphasis on interdisciplinary studies than is common at engineering-oriented colleges. In place of conventional course and distribution requirements for determining the major, the WPI faculty defined four new competence-based degree requirements as the qualifications for an engineering or science major. Two of these requirements--an examination and a project--are in the major, while the other two, a humanities minor and an interactive project, develop the student's strengths in liberal studies.

The interactive project is perhaps the most innovative part of WPI's program. Students are asked to define, research and write up some topic of their choice linking science and technology to a social need or issue. The method of study in this interdisciplinary project depends on the problem chosen as well as student interest and background. Many but not all students select problem-solving topics in areas like environmental studies or consumer protection where the social impact of technology is defined by economic or legal methodologies.

Given the pragmatic and operational cast of engineering education, it is understandable that many of our students are attracted to interactive projects using a modeling or case-study approach to examine the impact of technology on society. To provide an alternative to this kind of project, a faculty group sought the formulation of projects of a more theoretical and conceptual nature. We wished to stimulate students to devise topics which related science and technology to society via a bridge in the humanities or arts. Thus in 1971-72, a group of faculty drawn from chemistry, physics, mechanical engineering, life sciences, art, history of science and literature began meeting to share ideas for interdisciplinary projects which could help students place science and technology in larger historical, philosophical or cultural contexts.

The following academic year, the group began working with some juniors on a series of projects to explore the development of Western science within this larger frame. The goal of these projects was to challenge our engineering, science and management majors to raise one or more of the three following questions:

1. Where do scientific ideas come from?

2. How is the "correctness" of scientific ideas determined?

3. Does creativity in science and in the arts differ in its basic nature?

Not surprisingly, we encountered from the students for all three questions an initial naive response, born of their earlier conceptualization of these questions and reinforced by the problem-solving orientation of subsequent studies. These responses may be summarized as follows:

1. Ideas in science emerge from the application of the "scientific method" of experiment leading to deducing the underlying principles from the resultant data. In this process of deduction, the subjective or intuitive role of the scientist is submerged; scientific laws in fact claim their potency from being freed from mere personal or individual bias.

2. Ideas in science are proven correct by matching the results of their application to the objective world. Different workers, separated by time and space, finding a correspondence between Nature and a law proposed for verification, thereby affirm the correctness of the proposed law. Again, the test is comparison with an objective nature, within which rests, awaiting discovery, the patterns of order which the scientist discloses.

3. Thus, the process of creating something new is fundamentally different in the arts and the sciences. Scientists draw from data amassed from objective reality, whereas artists or humanists depend upon subjective intuitions or emotional expressions. Snow is correct in suggesting that the gap between the "Two Cultures" has become fundamental and unbridgeable.

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With challenging these views in mind, the faculty group began working with some sophomores and juniors to flesh out some appropriate projects. One or more faculty advised one or more students on individual topics, with the whole group assembling once a week to investigate common ground. The experience which resulted will not surprise anyone who has attempted a similar enterprise: the difference in approach and opinion of the eight faculty dominated discussion, with students--whose experience in such free-wheeling confabs was limited--shrinking into physical and intellectual corners. After the first year of project work, it became apparent that students needed an exposure to the methods of interdisciplinary studies at a level more basic than what was expected of them in doing original project work.

In the summer of 1973, with support from a General Electric Foundation grant, the faculty group set out to design a course which would develop a model for interdisciplinary research, as well as present a rich enough diversity of topics to appeal to a wide constituency of student interests. The topic chosen was "Light and Vision," for several reasons. As we now conceptualize the process of seeing, both an objective stimulus--light--and a subjective response--seeing--is involved. The clarification of seeing as a psychological interpretation of objective data is of recent origin, and the centuries of thinking about seeing which preceded this distinction are rich in examples of how hypotheses emerge from underlying assumptions, or what Gerald Holton calls "themes." The phenomenon of vision is so embedded in our unquestioned daily routine, that it constitutes a test case for how scientific abstraction treats so commonplace yet so vital a part of our accepted environment. The question of how many people have responded to light and vision is woven through practically every present-day "discipline"--through not only virtually all the physical and psychological sciences, but through art, literary imagery, and religious and mythological constructs. Correspondences abound which illustrate how in different eras scientific and artistic innovations concerning light and seeing influence one another. Finally, consideration of how little we really know today about either light or vision--whether light is particle or wave, how the brain formulates a rich colored and dimensioned "picture" of the world from nerve impulses--reminds us and our students of our limits, and sets any sense of inevitable "progress" from ignorance to knowledge in a proper frame.

"Light and Vision" was first offered in the spring quarter of 1974. The initial presentation again erred by offering too much material, thus overwhelming the students and submerging the important themes. After several years' experience, a more compact set of topics emerged, which centered around four modules:

1. The earliest mythic accounts of light, which (in Holton's terms) offered "multiform, undifferentiated, anthropomorphic" accounts of the central role light played in creation stories, leading to a separating out of different disciplines

among the Greeks and the emergence of the first "scientific" ideas about light and seeing.

2. The transition from medieval to Renaissance ideas about seeing, which is mediated by the development of linear perspective in art; where changes in art take the lead in offering a fresh view of what "seeing" is.

3. Newton's formulation of the essentially modern idea of the relationship between light and seeing in *The Opticks*, which not only offered a theory of light which was articulated into Newton's worldview dominated by God and gravity, but which also presented a bold formulation of a scientific method ostensibly based upon experiment and deduction. The impact of *Opticks* is examined in terms of both scientific and non-scientific responses.

4. The revolution in physics associated with relativity and quantum mechanics, and the relationship of this shift in worldview to the development of non-representational art.

To tie these modules together, the lecturers try to demonstrate a constant "deallegorization" (again, Holton's term) whereby the disciplinary strands implicit in the earliest creation myths increasingly take on separate methodologies; the initial "multiform" myth where religious, scientific and artistic reponses to light rubbed shoulders breaks down into increasingly specialized and distinctively modern disciplines. Historically, texts range from excerpts from an Akkadian creation myth to elementary descriptions of quantum mechanics; in terms of disciplines, developments in physics, physiology and psychology are presented along with extensive discussions of the origin of Renaissance linear perspective, of Impressionism, and of Cubist art.

By means of the lectures, class discussions, and assignments, students encounter a version of the "scientific method" which, we hope, is more sophisticated and realistic than the naive view sketched initially above. Specifically, we stress Holton's idea of the importance of "themes" (personal assumptions or presuppositions which the scientist absorbs, often unawares, from the surrounding tradition and culture). Thus, a theme in science serves to filter out from the myriad of possible collectible data and structuring models just that evidence and model which fit the scientist's style--and may just lead to a scientific revolution. Examples touched upon in the class are Newton's assumption that light is a particle (and thus like the rest of his universe responsive to gravitation) and Einstein's confidence that "God does not play dice" with Nature's laws

With the framework of Holton's essays on scientific creativity, a more complex model may be developed of how the "correctness" of scientific ideas is decided. Using also Kuhn's well-known idea of the paradigm, we introduce students to the role in accepting or rejecting new ideas which the community of scientists plays. The naive sense of nature as an ultimate objective reality against which all scientific ideas are tested is further challenged by the interpretations of quantum physics of Heisenberg and Bohr (contra Einstein); here the observer acquires a significant influence in deciding the results of an experiment. Simply put, in the pursuit of scientific truth, the questions researchers ask become as important as the answers nature yields.

Those students who grasp the points Holton and Kuhn are making about scientific creativity (and it would be unreasonable to expect that all do), are prepared to reconsider Snow's notion of the gap between science and the humanities as uncrossable. Both scientists and artists use both reason and intuition, objective observations and subjective feeling. Newton's finding seven colors in the spectrum, Einstein's hostility to a probabilistic interpretation of quantum mechanics, do not arise from the phenomena; such intuitive choices reflect personal styles as fully subjective as the idiosyncracies of an artist's style. Artists reason, scientists feel their way towards their results, just as much as the other way around.

Clearly what I have outlined above are the faculty's goals for the course--not every student emerges with a secure sense of each point. But evaluations indicate that most students do grasp the underlying arbitrariness of a simplistic and reductive model of scientific research. Interest in the course has remained gratifyingly stable since its inception in 1974, with between eight and twenty-four students enrolled in the annual offering; the most recent class had eighteen. Students can use the course in the humanities minor as well as a basis for further interdisciplinary work. The course is taken as part of a humanities program most commonly by students minoring in history of science or of art, or in philosophy. (The WPI minor consists of five thematically-related courses capped by an independent study.)

Interdisciplinary courses are often born in great excitement but too often languish and die as the faculty staffing them lose interest or support. "Light and Vision" fortunately has a secure if not enormous base of student interest as a component in the required humanities minor. The externally-funded group of eight who designed and first gave the course has undergone some shrinkage because of changes in professional interest. At present, two of us, professors of literature (the present author) and of chemistry, coordinate the course, presenting most of the lectures and leading all the conferences (there's a double session each week for discussion of issues raised in reading the Holton essays.) Each of us is present at every session, though direct interactions are usually limited to the conferences. We make an attempt to cover material in the lectures with which we normally are not associated professionally; I do most of the lectures on Newton, one on modern physics, and two on thematic debates in psychology of perception. My colleague in chemistry does all the lectures in art, along with the remainder of the topics in modern science. Thus we try to present ourselves as role-models for interdisciplinary studies, as well as lecturers.

In summary, then, "Light and Vision" serves the purpose of introducing students to interdisciplinary studies by raising questions about how creativity in science is influenced by the traditions and conventions of the culture in which the creative scientist is embedded. The course seeks also to present an extended case-study of ideas about how we see and what light is, drawing for evidence upon as wide a range of topics as we can. The course has found a secure niche in our curriculum as a component students may use in self-designed humanities minors, as well as in preparing some students for continued independent research in interdisciplinary studies which may satisfy WPI's second non-technical degree requirements. The two faculty most closely associated with the course have enjoyed the opportunity to work with students in topics outside their usual area of expertise, and have in both cases become engaged in new areas of professional research arising from topics first broached in preparing for the course.

Best of all, some of our students have come to recognize that science is not the coldly objective, mechanistic process of guaranteeing successful results by applying an infallible "method." Science is not the antithesis or antagonist of the Arts. Scientists, like artists, make use of intuitions, of assumptions which do not arise from the data they address. In ways which differ in degree but perhaps not in kind, both scientists and artists observe the fine structure of the external world. The patterns they "see," they half observe, half create.

INTRODUCING THE LIBERAL ARTS THROUGH INTERDISCIPLINARY INQUIRY: PROPOSAL FOR AN INTEGRATIVE GENERAL EDUCATION EXPERIENCE

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> We can deliberate about things that are in our power and can be done.
> Aristotle, *Nichomachean Ethics*

The beginning of the contemporary undergraduate's study should involve him in the inquiry experience, encompassing library and field research, for several reasons which include both cultural and psychological evidence that a student is more successful in integrating the purpose and abilities of a Liberal Arts education when he is an agent in the direction of his own studies. The inquiry should be interdisciplinary, for the student has not yet reached a maturity of disciplinary knowledge that will allow specialization in a depth that permits self-direction. This imperative will appear strange to many who are proficient in higher interdisciplinary research, that is, the inquirers who have mastered several disciplines and employ them in their thought, for to be interdisciplinary normally connotes a complex integration of methodologies. As Jonathan Broido expresses it, an interdisciplinarian must be able to describe the explanatory utility, predictive power, and information-theoretic measures of the fields that he employs.[1] Those academics who are suspicious of interdisciplinary thought and inquiry, accusing it of conceptual confusion, lack of intellectual rigor, and in its undergraduate pedagogy, an impediment to the development of disciplinary competence, will be equally puzzled by a claim that freshmen should begin their orientation to the Liberal Arts through interdisciplinary inquiry.[2]

My presentation of a freshman program in interdisciplinary inquiry is based on an understanding of the concepts of questioning and methods of library and field research "generic" to the social sciences and the humanities,[3] yet at a level of simplicity prior to the higher level of disciplinary organization that is accomplished gradually in the upper levels of undergraduate study, and polished in graduate work. I will present a view of interdisciplinarity and inquiry that focuses upon developmental principles of thought which must be realized before sophisticated disciplinary and interdisciplinary inquiry can be undertaken. The first section of the study will develop theoretical assumptions of cognitive development , and of the inquiry process, upon which the outline of the freshmen studies program, in the second section, is based.

An interdisciplinarian is always skilled in several disciplines. He is distinguished from the disciplinarian by his willingness and ability to bring questions, research methods, and data analysis to his work that are drawn from these several disciplines. The disciplinarian may be quite cognizant of the limits of his particular field, and the value of the other fields in augmenting problems he addresses, but the disciplinarian will not actively entertain these questions in his work, nor venture beyond the boundaries of research methodology that are customary for his domain. Such suppression of questioning and research exacts a penalty upon the disciplinarian, even one brilliant in his field, and sensitive to the design of other fields. The penalty touches upon the breadth of his vision of the world, the cogency of his knowledge, and the nature of his own response to that knowledge. One may know his own limits and values, and what others may do, but unless one participates in the practice (praxis) of actively questioning and seeking knowledge in a manner that reflects questions and methods of inquiry from disciplines whose horizons touch upon the diverse factual domains every individual experiences, he will be limited in the knowledge of both his own human experience and in the implications of his own research. These domains of factual experience are broadly represented by the humanities, that study the expressions of the human spirit and intellect, the social sciences, that study the behavior, institutions, and cultural artifacts of human groups in an effort to comprehend laws and norms that explain individual action, and the physical and biological sciences, which explore the composition, structure, and processes of inorganic and organic nature. The mental, physical, cultural, emotional, sensational, and spiritual facts derived from the perspectives and methods of inquiry from these domains enrich the inquirer in an active knowledge (Erlebnis) of the corresponding realms of his own person.

Reflection upon evidence gathered from the several domains of human experience and nature inevitably bring self-knowledge as the knower weighs the differing facts that touch upon the issue he investigates. An insight into the human condition seen from the perspective of biology is complemented or challenged by one from the perspective of psychology. In the dialectic of diverse domains of evidence, the knower increases his knowledge of the structure, composition and process of knowing, and thereby his own possibilities of being an active knower in the world. With each encounter with the human condition and nature from a varying avenue of inquiry, he becomes himself somewhat different in abilities and attitudes as they are exercised in the world. Perhaps the boldest assertion of the distinction between the disciplinarian and the interdisciplinarian that we will make is based upon diversified knowledge and its impact upon the knowing person. In his active syntheses, through the conduct of inquiry, the interdisciplinarian establishes a holistic view of human experience in the cultural and natural world that incrementally, with every gain in knowledge individuates him as a singular person. Individuation has implied becoming more of oneself through the successive acts of knowledge that enable more of one's total being to live consciously in the world, since the concept was first introduced by scholastics, such as Duns Scotus and Thomas Aquinas.[4] As Aquinas stated of an act that seeks knowledge, it is not so much an act of doing as an act of becoming something different oneself. It is a self-modification brought about by the objective possession of something other than oneself.[5]

This growth in one's own person is, potentially, a growth in the understanding of other persons, as well, for one sees the human condition more fully in its diversity. The interdisciplinarian is thereby equipped to comprehend the ground of understanding of someone who inquires from viewpoints different from his own, given some participation by him on that ground. He learns modes of demonstration that can communicate even the specialized knowledge of a particular field in terms that can be comprehended by individuals unfamiliar with that field, for he has a broad-based knowledge and vocabulary that encompasses the manner in which specialists in other fields ask questions. In his search for a personal, holistic understanding, he develops a common vocabulary that also enables him to translate his findings to the world of everyman. As Aristotle argues in the *Topics*, in order to demonstrate the truth of a particular science, the idea or principle must be stated in the principles of several sciences, so that specialists in other fields will see the meaning and significance. Moreover, in casual discussions with non-specialists, an effort must be made to keep the demonstration upon the ground of understanding of the lay person in order to be able to point out his errors in reasoning, and guide him to appreciation of the facts in terms that are integrated to his present understanding.[6]

A cogency of argument, and the breadth of vision that supports it, are acquired then through incremental steps of reasoning from several disciplines. One builds gradually a system of understanding, a Weltanschauung, that is articulated in a series of theses about experience, each of which reflects the particular perspective of an established discipline. However, these theses are integrated into the whole vision in a manner that influences each single thesis so that one's formulation in each is a creative synthesis that reflects the implicit or explicit presence of other perspectives. One's theses always have a distinct originality because of the personal design one has realized in his successive understandings. Together, they all reflect a system of understanding, a design of one's own construction, arrived at through the varied questions that lead one into, and through the acts of inquiry. Immanuel Kant spoke of this system of understanding in each thinker as an architectonic that in its overarching design provided a standard of idea that informed the significance and implications of any empirical investigation. He differentiated between the overarching architectonic and the empirical systems followed in the particular moments of an investigation.[7]

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Kant was a thinker who must be considered a model of the interdisciplinary incremental gains of intellect and self-knowledge described above. He borrowed from anthropology, as it existed in his day, and biology, in order to demonstrate his understanding of the transcendental mind and its operation. He was quite aware of the necessity for the self-developed theses, and the larger architectonic arrived at through successive questioning. He stated that unless one engaged in the intellectual practice of creative questioning beyond one's inherited discipline, one would suffer in one's humanity as well as his thought. He called the inherited mode of questioning provided by a discipline a historical system.[8] The thinker who only adapts the historical system, rather than integrating empirical facts in a cogent, self-aware manner into his self-constructed architectonic, is "a plaster-cast of living man," whose accomplishment is empty of significance.[9] A self-developed system, as we will see, is the product of naive and educated questions, as in the case of Kant spanning decades, which inevitably embrace the perspectives of several divisions of knowledge. The interdisciplinarian becomes so incrementally over years of formulating and following diverse questions that are the core of the guiding idea he brings to any project. His architectonic will include a greater diversity of empirical fact than the disciplinarian because of its multiplicity of perspective tested in his own experiences, and provide, consequently, a broader vision of the task at hand.

It is difficult to offer any historical person as a model of the ideal-type of interdisciplinarian, for we are fallible creatures of our cultural matrix, and no single individual can rise completely above the incompleteness of the questions, and the biasing factor of any research methodology employed. Moreover, Kant himself was a thinker within the inherited paradigm of Wolff and other deductive forebears. Who can create free completely from disciplinary tradition? Nevertheless, I will suggest that thinkers such as Werner Heisenberg and Sigmund Freud can be seen as examples of the intellectual virtues of interdisciplinarity, even in their limitations. Heisenberg's "autobiography of an idea" wherein he traces the sources from humanities, social sciences, and physical and biological sciences that led him to his own architectonic, and its consequent discoveries in Physics, is a text that shows the extreme importance of Aristotle's admonition in the *Topics*.[10] Casual conversations, and dialogues with specialists in other fields, helped him to clarify questions he gradually formulated within and beyond his field, questions which sharpened his awareness of Physics from within and without. As he states in his Preface to *Physics and Beyond: Encoutners and Conversations:* "Science is made by men, a self-evident fact that is far too often forgotten. If it is recalled here, it is in the hope of reducing the gap between the two cultures, between art and science. The present book deals with the developments of atomic physics during the past fifty years, as the author has experienced them. Science rests on experiments; its results are attained through talks among those who work in it and who consult one another about their interpretation of these experiments. Such talks form the main content of this book. Through them the author hopes to demonstrate that science is rooted in conversations."[11] Sigmund Freud broke through the diminution of personality imposed upon mentally ill patients by the psychiatric paradigm of the nineteenth century with the help of literature, philosophy, aesthetics, and questionable movements within his own field, such as hypnosis and Breuer's "talking cure," which stressed the singular subjectivity of the individual.[12] He gradually formulated questions about human subjectivity, and its role in the human condition that became an architectonic which helped him see the complex, subjective dynamics of the unconscious mind and describe the individual patient in a depth never before achieved in medicine. His conversations with individuals within his field and in other fields were critical for his own changing questions from which his architectonic was built.[13]

The brilliant disciplinarian accomplishes striking factual discovery and significant syntheses within the range of problems and explanatory hypotheses customary to his field, but his questions limit his incorporation of the perspectives of other fields into his own work, and thus limit his integration of the other factual dimensions of experience into his problem or project. His architectonic is narrow, and the empirical facts he gathers often exclude data which would enrich his own field. Freud's inability to convince Joseph Breuer that the latter's aborted "talking cure" therapy demonstrated the causal role of ideation in mental illness is evidence of how the disciplinarian can deny pertinent information because of his own limited, disciplinary architectonic of acceptable theses.[14] Breuer's refusal to follow his own innovative idea puzzled Freud, and in later years has been explained as Breuer's fear of his own counter-transference to Anna O., the patient with whom the first therapy that probed the "subjective" depths of personality was developed.[15] The acquisition of new knowledge, as Thomas Aquinas asserted, is more than an act of doing, it is an act of becoming something different oneself. Had Breuer followed his method he may have realized the circumstances of his attraction to Anna O., growing thereby in self-consciousness, and consequently in his integration of new humanistic insight into his praxis. There is a risk in every act towards knowledge, for one must become somewhat different in his feeling, thinking, and acting in light of that gain. Moreover, a question takes time to answer, and in the period of uncertainty, one must continue to go forwards, often through fears generated by the uncharted territory.

There is an adventure in knowledge for the inquirer who has matured with an education that encourages self-formulation of questions and self-direction in the search. What may be called a scientific story is lived by that individual as he seeks in each problem entered the realization of what Immanuel Kant designated as the three conditions each articulate idea must satisfy: 1) the knowledge must be cogently related to the thinker as an experiencing individual; 2) the knowledge must be related to the manifold of objects considered in the field of experience; and 3) the knowledge must be translatable to all things in general, even beyond the immediate field of experience.[16] In other words, the individual must undertake the classic journey that involves him in the trials of life, widening his horizons, that journey depicted by Dante's *Divine Comedy*, Cervantes' *Don Quixote*, Bunyan's *Pilgrim's Progess*, Goethe's *Wilhelm Meister*, Dickens' *David Copperfield*, and the more modern, explicitly scientific journeys of Werner

Heisenberg's *Physics and Beyond*, and Margaret Mead's *Blackberry Winter*. The first naive questions which disturb the inherited framework of thought, introduced with an unexpected encounter with new elements beyond one's home territory, leads to experiences that inevitably promote new questions and further experiences, maturing the questioner in the process. Each answer is triple-edged: the inquirer comes to know his own person more profoundly as he sees the relevance of the answer to his life; the life and natural situations in which he stands are amplified in their complexity and meaning; the historical experience of the individual, and consequently the world he has known, and the world he expects to encounter, is enriched and widened in its range.

Inquiry originally had such a meaning of empirical adventure in the ancient Greek world where the concept was first formulated. The Pre-Socratics developed the concept of *historia* to explain the integral relation between the questioner and the laws of human and physical nature. *Historia* meant inquiry into particulars that arrived at the universal laws of which they were part; it meant also the history of events that progressed according to those laws; and, more importantly for the challenge to the questioner, it meant his relation to life in the light of those laws.[17] As inquiry was formalized into reserach, study of human and natural phenomena guided by more rigorous methods of investigation, the Greek thinker maintained his sense of participation in life according to the laws he identified. The researcher lived in search of the truth, and shaped his personal character according to his conceptions of that truth. As Heraclitus put it: "Man's character is his fate; the waking have one common world, but the sleeping turn aside each into a world of his own."[18] By engaging in *historia* one could develop an understanding of the world and oneself that was grounded in certain knowledge, a knowledge that was true for every human. Plato's and Aristotle's attacks on the over-specialization of the Sophists was not in their search for laws, rather in their neglect of the implications of their strudy for their own life in the world. Human meaning was rooted in an understanding of *physis*, human and physical nature; as one understood nature, one understood what was morally correct. Socrates demonstrated in his life all of these precepts; we are quite familiar with the courage he displayed on his empirical adventure.

The implications of *historia* for the contemporary student are the same as they were for Heraclitus and Socrates: each person must develop through empirical inquiry and research a sense of the laws of human and physical nature which guide his spiritual and organic existence, committing his own involvement in life to that understanding. Educators must help the individual to see the earnestness in action implied in the pursuit of knowledge. We live in a world that justly cautions us that any gain in knowledge must be viewed as a probability, open to revision, and more study. However, a "relativist" view of reality does not preclude an earnest commitment to these very precepts, which require on-going research; the moral implications of the position stress openness to the work of others, and the significance of our interdependent relation to the thought of others. Whether we still feel that one certain unified theory of *physis* is possible, or hold that we are epistemologically excluded from such certainty, every reasoned position has its moral guidelines for life in the world.

Historia has in its original conception also the notion of the scientific "story" of life.[19] The myths included in Plato's dialogues were his way of unifying the spiritual meaning that enveloped every particular truth. A story enables the teller to see what Aristotle later called the "formal cause" of particular phenomena and events. The finished shape or form towards which things develop to become what they truly were must be kept in mind as one related to them.[20] The large stories of Marx, Freud, and Darwin still offer many of us a sense of the formal cause of particulars. Even the "relativist" story is a formal cause. The contemporary student must be helped in forming such a "story," a sense of the formal cause of phenomena, as he pursues his inquiry in various fields. Even when such "stories" must change to accommodate facts, the presence of such a synoptic vision for the individual allows a change that is coherent across the many dimensions of his life implied by the facts.

Perhaps the value of a coherent theme that links diverse areas of facts, and integrates one's own life in an informed manner to those facts, physically and spiritually, is best seen in the reemergence of *historia* as a guiding principle during the Italian Renaissance. The Italian Renaissance created a view of the inquiring individual which still is one of the strong roots of modern humanism and science. We see in Dante's *Divine Comedy*, in every canto, the inductive exploration of human and environmental *physis* to ferret out the natural and moral laws that can provide the individual with certainty of his place and next action. Dante was "rediscovered" in the era of the Enlightenment, and has remained significant in our contemporary age, not because his thematic understanding was right, but because he exemplifies the researcher who fashions a life according to an earnest commitment to self-discovered law.[21] His vision of every moment fascinates the contemporary thinker even yet because life was seen through his eyes moment by moment, with a keen sense of the interrelation of all aspects of the visual field. He articulated what we call today a coherent *Gestalt* that saw complex levels of significance in every event in its tangible signs. Several generations after Dante, Leon Battista Alberti gave theoretical clarity to this vision of moment to moment life as a unified *Gestalt* with complex import in his treatise on painting.[22] Alberti called his theory *istoria*, a clear relation to the Greek concept. The three major principles of *istoria* were: 1) every painting must have a unified theme which orders all particulars; 2) the painting should stress the empirical tangibility of human and physical nature, the factual rendering informing the theme; and 3) the visual field should be true to human perception, so that the viewer of the painting could, as it were, see the meaning of the painting as he would see any event as he perceived it in life. Alberti's theory led to the deep extension of three dimensionality that gave the visual and spiritual field of the painting a potential empirical infinity.[23] He allowed by his theory the singular interpretation of common themes by individual artists. Each artist told a "story" that gave his individual imprint to cultural tradition. Each artist was challenged to integrate the singular meaning of his own life in each communication of the laws that governed himself and all other humans.

Through historia, every separate inquiry can help the inquirer become cognizant of his own values and modes of thought. His individual questions are gradually recognized as threads in the whole fabric of his life. To paraphrase George Eliot, 'Every earnest search for knowledge within the world by an individual is also an earnest search within himself.' The inquirer learns with the certainty of his cumulative search his capabilities as well as his limitations. He comes thereby to choose his pursuits more self-consciously, and more self-directedly. As Aristotle stated, "We deliberate about things that are in our power and can be done."[24] As we turn to a program that introduces inquiry and research, and a life of self-direction for the undergraduate, historia will be an integrating concept, a concept that, as we will see, necessarily implies interdisciplinarity in the empirical adventure of the Liberal Arts.

The introduction to higher education through interdisciplinary research discussed in this section is a two semester course that conceives research in that middle-ground between inquiry and specialized disciplinary methodologies where the inquirer may still feel at liberty to ask naive questions, and explore strategies of gathering evidence that reflect the formal reasoning methods he has developed as a natural human function since adolescence. The explication of the course phase by phase will hopefully convince the reader that the experiences of the student do constitute a research that is very important in securing a love of the path he may follow in more formal disciplines. The gains he will make in the consciousness of what research means will become evident as the content and processes of the two semesters are described. His gains in knowledge of himself, as I hope to demonstate, could not come in as explicit a manner in any array of disciplinary courses.

With historia as the integrating concept, one may view the pedagogy of the interdisciplinary course as even more important than its content. If there is a weakness in conception, it is in its stress on process, which I will attempt to keep in balance with the kinds of information that a freshman should be given about culture to provide a foundation for further study. Process is stressed in inquiry because historia demands a coherent working system of understandings in the individual which help him integrate the meaning of separate factual studies into a world view, and help him integrate his own sense of self into that world as a potential contributor. One of the contemporary labels for this emphasis on the learning process of the individual is person-centerd teaching. Those who promote such teaching share a fundamental view of inquiry with the Greeks of the Classic Age, the Renaissance humanists, and the thinkers of the Enlightenment--the competent individual is the center of knowledge in his abilities of reasoning and self-expression, rather than specialized fields of study that must be mastered. Each of these preceding ages added to our knowledge of complex individuality because of this person-centered perspective where the process whereby knowledge was attained was of more moment than the information acquired. Kant defined the Enlightenment era as a cognitive and conative exercise of skills, a process, that placed the individual in an adventure of knowledge:

> Enlightenment is man's release from his self-incurred tutelage. Tutelage is man's inability to make use of his understanding without direction from another. Self-incurred is this tutelage when its cause lies not in lack of reason but in lack of resolution and courage to use it without direction from another. *Sapere aude!* "Have courage to use your own reason!"--that is the motto of enlightenment.[25]

The course that follows is chiefly a process experience in skill development and self-direction. Five process variables have been isolated that humanists and social scientists in our era have pointed to as the intellectual, emotional, and behavioral skills that underlie self-direction in inquiry: cognitive ability, cultural aspiration, task motivation, task performance, and locus of control and self-esteem.[26] These variables are an anatomy of the competencies of historia, and form the broad goals of the course described below as a whole, and in every class that comprises the whole.

Goal One: The cognitive ability to adapt to and modify new situations.

Most educators see cognitive ability, as measured by intelligence and achievement tests, as the chief variable in student performance and persistence within the educational system.[27] What is cognitive ability? Intelligence tests that determine this entity reflect three basic dimensions: the capacity to learn, the ability to think abstractly, and adaptability to new situations.[28] It is the ability to think abstractly that is most often tested at the college level in classes where students are placed solely in a response mode to the problems designed by the instructor. In order to encourage self-direction, however, it is the dimension of intelligence that Raymond B. Cattell calls "adaptability to new situations" which must become the major orientation of curricular reinforcement and testing. Problem-solving and inquiry, which carry students through multiple environments, and involve them in both psychological and behavioral dimensions of self will create a movement in them towards historia as a character trait. The student will learn to adapt to, and gradually modify new situations in his knowledge-seeking; every class will become an arena for his self-testing as he is challenged by the need for self-direction.

Goal Two: Identification of the inquiry objectives of each student with his present and potential cultural reality.

Cultural aspiration includes identification with one's culture and a desire to conserve or to improve it. The student has an implicit connection to his state of culture that can further or retard his interest in the educational process, and the subject matter of that process.[29] In the course below cultural periods drawn from the Western world, as well as contemporary American history, are emphasized. These cultural foci may be changed to accommodate the background and interests of the student. It is vital that the student conceive each project of the class as a meaningful exploration of his cultural roots or his present situation in life. Historia can only be cultivated as an inquiry process when the individaul invests his identity in the tasks before him.

Goal Three: Each task in the continuum of the course must be understood by the student as meaningfully in tegrated into his long-term goals in the culture.

John W. Atkinson and Joel O. Raynor have offered evidence that every educational task asked of the student must be related to a preferred long-term goal of that student if he is to invest himself in the task.[30] The individual who can formulate the task at-hand in terms that link it to either a future goal, or a step in the development of his own sense of identity, will move towards self-direction with a clarity of purpose that augments the general assignment of the instructor. In order to promote this clarity, the instructor must articulate clearly the objectives of the task in a manner that allows each individual to reformulate the objectives in the light of his present interest and future direction. With each statement of a personal objective, the student places himself within historical time, conceiving his task as a movement forward in that time. The instructor should explain orally and in writing the general objectives for every major segment of the course, and request a series of individual goals from the student that situate him within those general goals and within the objectives of his own life situation.

This self-awareness in the student can be achieved through student conferences, periodic in-class small group exercises, and model cases offered by the instructor. Working with fellow students in the clarification of personal objectives will enhance a sense of citizenship in a community of effort for the individual. Ideally, the class can become a microcosm of the interdependent, yet individual reality within the community beyond the classroom in which the person will transfer the knowledge and self-directive abilities learned in his educational projects. Listening to, and helping in the development of the objectives of other students in a common assignment will breed appreciation in each student for the diversity and interrelatedness of the human community.

Goal Four: The projects asked of the student should stress performance that is self-directed, and be assessed chiefly by the quality of effort rather than the "correctness" of answers.

Otto Rank, in discussing the primary path to mental health in the twentieth century, states that one: "is helped not by more knowing but only by willing, not by knowledge of his fate but by the living of his self-determination."[31] Each class and major phase of the course should incorporate exercises and projects that allow individual variation in the completion of an assignment. Assignments should be designed as open frameworks which a person's thematic interest and personal question can address. Even in a class that is more lecture oriented, when subject matter is presented to the students as an initial introduction of its nature, historical importance and meaning, as seen by the instructor, there is time for "naive" student responses within a conductive pedagogical format. The student response is an act of "centering" whereby the student links his own history of interest and perception to the material. It is only a naive response in terms of its unschooled eye in the formal context of the cultural artifact. In the deepest sense of historia the immediate judgment, even in its crudest expression, is taking a relation to the material that enhances its significance for the person.

The assessment criteria for these acts of "self-determination" should focus upon the clarity of intent, the involvement displayed in the oral or written response (determined over time by the norms of self-disclosure, detail and depth of inquiry, and relatedness to areas of interest that touch upon the individual's cultural environment) and the originality of expression, judged by examples brought into arguments and demonstrations that have not been offered by the instructor or the textual materials. The instructor should facilitate small group and class discussions to underscore the "rightness" of every position, differentiating the quality of a position by its thoroughness, clarity, and cogency.[32]

Goal Five: The projects asked of the student should enable him to experience a sense of agency, closure, and ownership in what has been accomplished.

The exercises and projects of the course should be designed to enable each student to manage his own progress through the assignment. The steps required should be carefully outlined so that the student can orient himself to his successive accomplishment of the task.[33] In this manner he experiences personal agency, and develops what psycholgoists have called "internal locus of control."[34] Each exercise and project should be planned so that sufficient time and the necessary ability are possessed by the student so that he may achieve some degree of closure. Assignments should be constructed in phases to assure a sense of closure in part, even if the entire assignment is not completed. There must be continual "feedback" built into the classes, based upon segments of assignments, so that the student can know his success or where he strayed in his work. Ownership of inquiry is arrived at through a self-consciousness of work done well, or at a minimum, work that progressed to a point that needs more work. Self-esteem is developed upon a factual ground of real effort within a course that considers agency, closure, and ownership.[35]

These five goals express the five process variables that lead to historia in inquiry. They are not really isolated in learning, rather they are integrated, well or poorly, in their expression as the student directs himself to the task at-hand. A good integration is furthered by a pedagogy that stresses 1) person-centered learning, i.e. that instruction which elicits the personal interests, values, and agency of the student; and b) interdisciplinarity in the breadth of problems to be considered and the variety of research methods that are introduced to address those problems. Person-centered learning places the student in a self-directed relationship to the processes and content of what is studied, and is conducive to intellectual and emotional investment by the student in the issues that partake of his immediate life in the culture. We will see that this emphasis involves the variables of cultural aspiration, task motivation, and locus of control and self-esteem in a manner superior to that possible in non-person-centered courses. Interdisciplinarity in problems and methods insures that the student will be exercised in the entire range of cognitive and conative skills which underlie research in the arts and sciences, while supporting the vision of a common world in which the disciplines may cooperate to improve life. Thus, the variables of cognitive ability and task performance are enhanced in what may be seen as a moral as well as a practical sense. The student will learn to see that research has a dimension of citizenship, as well as a gain in specialized knowledge, through his appreciation of the diversity of research required for an improvement of culture and society, and in his exploration of cooperative forms of research among different fields.

I will give a narrative of the course in its sequential phases emphasizing the five process variables of cognitive ability, cultural aspiration, task motivation, task performance, and locus of control and self-esteem at particular phases of the experience, and how these variables further historia in their specific manner. One should keep in mind, however, that all five play a role and are developed in every phase because of the unity of these dimensions in any act of inquiry. The two semester, six to eight credit course,[36] is feasible for freshmen, though some who have seen the design question the ability of students at this level to accomplish inquiry that carries one into field research. I have taught freshmen library and field research as well as humanistic cultural analysis for almost a decade according to the methods suggested in this paper. Our freshman program has been evaluated as a model program by the American Association of State Colleges and Universities, and it has been praised for those features that are recorded in the five process goals.[37] Because of the free choice of course and sequence allowed students in the public university of the University of Louisville, these freshman courses were never combined into a two semester, mandatory sequence. Thus, I have never offered the course in quite this design, but have taught all the parts to freshmen. I recommend to anyone who might attempt the model offered below that he evaluate his own prior experience with students, and select those features that he feels seem feasible, given his own existing sense of agency and experience. As any model, it is designed to be taken apart, and its configuration varied to suit the conditions at-hand.

The model will be presented first in an overview that suggests approximate time of learning in each phase. This time is based upon my experience with students who ranged in age from 17 to 75 years, and scored between 8 and 20 on ACT exams.[38] Some students, of course, moved faster than others, with the ACT being a fairly good predictor. We had a developmental lab in critical thinking to help students with ACT scores from 8 through 14. The overwhelming majority of students, even with ACT scores of 14 or under, were able to complete library and field research projects in pursuit of meaningfully personal questions in one semester.[39] Separate texts for library and field research, designed in a manner that enabled the student to manage his own progress, in an inquiry based upon his own questions, helped greatly in the success we achieved.[40]

First Semester

Introduction to Inquiry: Highlighting the process goals of cognitive ability and cultural aspiration.

Phase One: A generation of naive student questions in relation to cultural artifacts (painting, sculpture, excerpts from literature, historical writing, and scientific experiments) from diverse historical periods, preferably from past centuries.

Time: Approximately two weeks.

Phase Two: The refinement of student questions by 1) formal definition, and clarification of concepts; and 2) reformulation of the questions to suit the objectives, methods and preferred evidence of several academic fields.

Time: Approximately four weeks.

Phase Three: Library research by the student that locates research studies which pursue a similar question to his own in several fields.

Group deliberation of how particular student questions could be formulated in the humanities, social sciences, and natural sciences, and how an interdisciplinary effort could be planned to answer the question from several perspectives.

Time: Approximately four weeks.

Phase Four: The writing of autobiographical cultural history by the student, guided by the questions he has formulated in several fields.

Class discussions in small and large groups of the autobiographies.

Introduction to field research: The student develops a survey instrument, based upon his cultural autobiography, and administers it to individuals who shared his cultural experience in his home, school, and work communities.

Time: Approximately five weeks.

Second Semester

Building and Testing Cultural Models: Highlighting the process goals of task motivation, task performance, and locus of control and self-esteem.

Phase One: The introduction of cultural model building on the bases of the social-economic, political, and religious values of a period of culture; and the interaction of exemplary researchers in the arts and sciences within that period. A major aim is to show the strengths and limits of the researcher as citizen, and the significance of cultural norms in stimulating, setting direction for, and retarding research.

Time: Approximately four weeks.

Phase Two: The students return to library research, tracking the creative careers of scientists and humanists in contemporary American culture who have pursued a question similar to their own.

The students then as a class develop a model of contemporary American culture on the same bases as the model of Phase One. The model emerges from the contemporary lives they have researched,informing their common knowledge of the culture with concrete instances of the interaction of cultural contributors within the stresses of their society.

Time: Approximately four weeks.

Phase Three: There are several options to this concluding phase of individual or small group research.

1) Small groups can form who have similar questions representing fields within the social sciences, humanities and natural sciences. The group designs quasi-experimental and/or experimental conditions for gathering evidence to answer a common question. They are guided in the design by a programmed workbook which helps them with the construction and implementation of survey instruments, behavioral observation, performance or artifactual testing, and cultural interpretation of the data. They seek a trend, rather than what would constitute a valid and reliable answer.

2) Individuals and small groups can develop and implement survey instruments based upon the contemporary cultural model of Phase Two, interviewing researchers in the humanities, social sciences, and natural sciences, to see how accurate their own generalizations are in relation to the researcher; then guiding class discussions of the results.

3) Individuals and small groups can develop cultural models of historical periods following the Phase One and Phase Two models, but stressing the questions most significant to them in highlighting the weaknesses and strengths

of the particular culture, and the breakthroughs and limitations of the exemplary researchers they include.

Time: Approximately seven weeks.

Discussion of the Two Semester Course and Its Phases: Integrating *Process* Variables Through Person-Centered Learning and Interdisciplinarity

First Semester

Introduction to Inquiry

The first phase of the introduction stresses the dimension of cognitive ability known as "the capacity to learn," or instruction in what cognitive and educational psychologists have called the "learning to learn" processes.[41] One must be able to attend and to orient himself to a discrete stimulus or phenomenon; one must be able to exercise acutely the senses of sight, touch, or hearing, i.e. one must listen with all one's attention; and one must begin to organize one's thoughts, and proceed in an orderly, if not planful manner in one's observation. Learning begins with this "centered" addressing, by the individual, of an empirical moment. The Greeks were fascinated by and skilled at exploring the particular as a first step in seeing the design or necessity of events. H. D. F. Kitto writes of their ability to exercise their nous, the intuitive comprehension of the object as a manifestation of a more general schema of meaning, arrived at through the keen seeing of its denotative and connotative dimensions:

> In the passage which I translated from the *Iliad* there is one detail that strikes me as being extremely Greek. 'His heart within his shaggy breast was torn, whether he should...slay Atreus' son, or put away his wrath.'
> Tennyson, translating Virgil, writes of a similar moment:
>
> This way and that dividing his swift mind.
>
> The mind, to be sure, is not the heart, but we should be astonished if Tennyson, or Virgil, in mentioning either heart or mind, had at the same time mentioned a physical detail of the body in which this heart or mind resided. Homer finds it perfectly natural to notice that the chest is a hairy one. He sees that whole man at once.[42]

This seeing of universal meaning in a particular act or artifact led to the sculpture of the Greeks, and the "in medias res" of Homer to the terse beauty of their drama. The first experiences of the student in his historia should begin similarly with empirical descriptions and thoughtful questions in relation to artifacts and events from differing periods of culture. The goal of these first weeks is to stimulate the interest of the student in things new and strange to him, to elicit genuine, "naive" questions about culture, while schooling his senses in accurate observation. The use of historical and contemporary visual and textual artifacts will indirectly inculcate an interest in the fact of culture and the continuity of its creators. The emphasis is not on memorization of the names of the things or persons who created them, rather upon the observation and the questioning. One or more instructors who can question along with the students, offering thoughts and queries from the perspectives of differing fields and divisions of knowledge, will begin to provide a model for the diverse disciplinary interests and their formulation into coherent queries. However, the student's own often clumsy questions should be given the lion's share of attention and careful respect. As Immanuel Kant said of democracy: "We cannot ripen to this freedom if we are not first of all placed therein (we must be free in order to be able to make purposive use of our powers in freedom). The first attempts will indeed be crude and usually will be attended by a more painful and more dangerous state than that in which we are still under the orders and also the care of others; yet we can never ripen with respect to reason except through our own efforts (which we can make only when we are free)."[43] It is this freedom to express judgments that allows genuine interests to become at home in the academic setting. The teacher should reward interest, descriptive clarity, and congruent generalization. *Historia* occurs with the wealth of pregnant questions, not with the closure of premature answers, or the application of traditional concepts from the side of the teacher. (The most exciting class I experienced as a student was one in American Constitutional history in which the teacher opened the first class by asking each student for his definition of democracy, and insisting for three more periods that more could be said by us.) The questions and observations made by the student in this first phase of the freshman program should be of sufficient scope and depth of interest to provide ideas that will be pursued by the student over the two semesters of the interdisciplinary course, and most likely over his on-going study of culture.

The artifactual study is conducted with only a minimum relation to the historical-cultural context. The individual stories of the cultural creators, the paradigms in which they worked, and the environmental stresses which acted upon them are only broached as they become significant questions to student interest. Even then, individual assignments are often possible so that the student can help develop the information. The format should be anthropological in the sense that the artifact's facticity in its material, shape, function and inferred signficance for human life in a specific environment should be the focus. If a student departs from this perspective in a question, ask him if there is some fact in what he sees that might lead to an answer. (Again, the models from my experience are ones that have the student dwell on observation, query, and comment for an extended time; one of the most interesting classes I have seen is a freshman drawing class in which the students had to select an acorn and draw it from different perspectives for 12 hours, over a period of a month. Goethe's botanical studies reflect this thoroughness, and from it came not only science, but the richest analogies to spiritual development.)

The second phase of the course is directed to the refinement of student questions. Exercises are given in the definition of the concepts used in key questions. The Aristotelian idea of formal definition helps the student ask single, coherent questions, and enables him to see how a focused question can in itself suggest a path to answer. The second aspect of cognitive ability is treated in this manner, the ability to think abstractly. The student is shown how a genus contains the general idea of specific facts, and how several artifacts which are observed can share genera elicited from his own question. The instructor at this point begins to work with the individual student question with a view towards its rephrasing to include the perspective of various disciplines. The didactic introduction of disciplinary paradigms in their historical locus of problems, evidence, and methodologies can now be integrated into the discussion. Yet, in this introduction of disciplines the central figure of the questioner should not be lost. The student must not feel that now reality begins, a lecture course, and that his questions were simply a gesture. There must be a continual counterpoint between the reformulation of questions, and the increasing knowledge of how fields formulate their questions, in concepts, direction of evidential interest, and the boundaries which are manifested in what Jonathan Broido has called the "radical egocentricity" of the disciplinary researcher.[44] Both examples of exemplary interdisciplinary researchers and single field-oriented researchers should be presented as they developed questions over time. The student should be given in the midst of these presentations an assignment that has them list several field-specific questions that are variations of their original question in a manner that suggests a potentially thorough interdisciplinary treatment of their interest. The time factor in thoroughly treating a question in actuality should be made clear in the examples of successful research, illustrating that it often spans generations, and that a contribution to knowledge is often cooperative, and when individual, limited. The student should be given a sense of the reality of the empirical adventure, tolerance for ambiguity, the use of inherited concepts and problems, but yet how thrilling a breakthrough can be, and of the immortality attained in the development of knowledge. Sigmund Freud is an example I use in presenting the pioneering aspects of research, and also its necessary augmentation of existing problems in several fields. I show his interest in the phenomenon of an "unconscious" in mental life from the time he listened to the lectures of the philosopher Franz Brentano, indicating the types of questions he developed concerning the unconscious within the influence of philosophy, then tracing the reformulations of his questions that dealt with the unconscious as he studied the problems that existed in other fields, such as physiology, psychiatry and anthropology.

The student is then asked in the third phase of the first semester to select several fields whose treatment of his question might be of particular interest. He is asked to look up a description of these fields in an encyclopedia and handbook of a division of knowledge that includes the fields. He is given a map of the college library, with the reference section circled, and asked to introduce himself to the reference librarian and ask for any orientation needed. On the basis of this initially limited library assignment a class discussion directed by the students explores the pardigms of particular fields. The instructor then shares several fields of special importance for his own question, which has been

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refined for this course along with the student work, and announces the next phase of the course which will be to explore how the fields the student has selected treat the issue of interest. The third element of cognitive ability enters the course, adaptability tonew situations, in the independent use of library resources as the student historia into his interest intensifies.

The instructor should introduce library research by taking the class to the library and modeling how he moves through various sources in pursuit of his disciplinary questions. Hopefully, he can transmit the genuine excitement of a search. A follow-up session with the library faculty offers the students informative lectures and demonstrations of how their information systems work. Audio-tapes can be made to be used beyond the class period by the student to guide him in the step-by-step exploration of particular sources. The instructor can also design informative "worksheets" which 1) guide the student in the location of background readings in the divisions of knowledge and particualr fields; and 2) focus the kinds of information which the student should glean from texts and journals in addressing how the field treats their question.[46] The student should concentrate upon how a researcher asks the question in which he is interested, what kinds of evidence are suggested by that question within the particular field, and what the limits are to the information gathered in the particular research study. A thorough answer to the student's main or sub-questions must be seen by the completion of this library assignment to be a product of years and interdisciplinary efforts. Class discussions of the findings of the library research will help secure this point.

The class is then divided into groups that represent the three major divisions of knowledge--humanities, social sciences, and natural sciences. Each group is asked to write a joint position paper on the scope of their division in its characteristic approaches to knowledge, and where overlap in its problems and methodologies with other divisions exist. A panel discussion led by members of each group explicate the particulars of their division's competence, and the possible areas of inter-divison cooperation. (The group dynamics of this discussion allows an "open chair" format so that other members of the group can enter the discussion.) Then, the instructor selects questions from the class members to be discussed by each of the three divisions with the goal of a reformulation of the question to suit several disciplines in each division.

The semester should be approaching Thanksgiving break, or approximately ten weeks of work by the end of this third phase. Thus, by the closing weeks of the first semester the student has begun his historia with a thorough development of a personally meaningful question, generated by intensive observation of historical artifacts, and refined through cognitive tasks requiring extensive definition and reformulation according to field specific criteria. He has by this time entered the threshold of knowledge sources that display how significant his question can be, and he has been helped to understand that he stands potentially among predecessors who have furthered his question over generations without exhausting its richness. He has been introduced to the modesty, yet grandeur of a researcher, in the lesson that cultural contribution emanating from an earnest question lasts a lifetime.

The final five weeks of the first semester, the fourth phase, seeks to solidify his ownership of the naive question and the sophisticated disciplinary questions he has posed. He is asked to amplify these questions by finding their roots in his past cultural experience. He is asked to write a cultural autobiography.

Research indicates that unless an individual identifies with the culture of which his learning partakes, he will not have the emotional or spiritual will to learn.[46] For members of the majority culture by birth this means that the individual must be shown how in fact he can contribute to that culture. The didactic discussion of the great cultural contributors to the West can "turn (the student) into stone with dumbness," as Socrates complained to Agathon in the Symposium, because the learning is offered in the style of the Sophists, allowing no thoughtful dialogue that is connected to the real experience of the student.[47] Unless one can see how in his own history of experience, and potential competence, he might pursue inquiry and research that might lead to some contribution on his part, the models of the reknowned can simply increase his sense of distance from being a part of history. For members of minority cultures, the necessity of an explicit connection between Western culture and their own lives is even more vital. The contemporary and historical exploitation of other cultures by the West, in its worst use of its knowledge and technology, appears confirmed in even the best thinkers at times. The inquiry approach can be an entry to cultural study that allows a minority student to see the strength of the academic paradigms, free of the dross of culturally biased applications, if he is helped to apply those methods within cultural problems linked to his inherited family and ethnic culture. Once he begins to feel what we will call the locus of control, the sense of personal agency, in his wielding of research methodologies, he will see that he can use these skills to integrate his cultural heritage into the mainstream culture.

Thus, in the final five weeks of the first semester the student is asked to write autobiographical accounts of his cultural experience that apply the questions he has pursued as helpmeets in analyzing and synthesizing that experience. He is encouraged through historical examples provided by the instructor to see how cultural contributors from past periods of history were often stimulated in their work by the pressures of their place in society and how their own guiding questions which remained fairly constant in all their research, were born of their cultural struggle. I have used Freud as a figure whose anger at his ethnic plight in Austrian culture undergirded, in part, his desire to find a cultural common denominator that would show the feet of clay of all persons. The motto of *Interpretation of Dreams*, taken from the *Aeneid*, an account of a defeated peoples' founding of a new land, is "If I cannot bend the gods above, then I will move the infernal regions."[48] The success Freud evidenced in turning his legitimate sword into a ploughshare, of transforming impotent anger into a sublimated search for the realms of consciousness that caused the discrimination he suffered, exemplifies the ethical goal that may be accomplished with the outrage many of our own citizens feel in relation to the majority culture. The examples from our own cultural history allow the student freedom to make his own formulations of his place in contemporary history with some originality. Moreover, the creation of historical continuums based upon the social-psychological problems that confront researchers, link all students emotively to the ever recurring ground of his contemporary struggle. The students share their reflections with each other. When each person's contemporary life is expressed in the aporia of self-involved thought, a mutual respect for the reality of these problems is bred in the class. There also develops, albeit indirectly, a sense of common plight that transcends self-righteous limitations. In these closing weeks of the first semester a third learning variable begins to be integrated, task motivation, yet a task motivation educated by the growing sense of interdependence in a shared world.

Second Semester

Building and Testing Cultural Models

Immanuel Kant wrote that without goodwill towards others in one's efforts, the most effective competencies will have negative effects within the culture.[49] Educating the skills of inquiry towards productive research can become a zealous desire for the student who is shown how his own cultural plight can be improved through what he has learned. However, unless his zeal is tempered by the recognition of a common world of other strugglers, whose cultural problems are equally significant, he will come to lack an ethical measure in his accomplishments that distorts the human proportion of his efforts. The human proportion of knowledge and its applications centers upon one's realization that we are a common species, and that what one creates must benefit all humanity. The researcher must also be a citizen. This means that he must 1) learn to live more intelligently in the world as a consequence of attending to the creative processes of inquirers from many fields; 2) see his commonality with others in the human community by recognizing the universality of the creative, inquiry process; 3) be open to dialogue with inquirers in other fields so as to intelligently appreciate the diversity of the common pursuit of civilization, as well as to inform his own work; 4) exhibit an active care for the environments of the world that support the inquiry of others; 5) realize that there are consequences to his work that he may not fully comprehend as they are directed to a public world complex beyond his knowledge; and 6) develop a vocabulary that can communicate the significance of his work to those who are not familiar with its problematic or outcomes.

Research into task motivation, while extremely interesting, and demonstrating convincingly that each separate task demanded in an educational environment must be tied to the self-concept and long-range cultural goals of the individual, has neglected the interdependent and historical world shared by each of us. The ground-breaking work of Kurt Lewin into task motivation and decision-making within a complex field of others analyzed individual movement towards a goal within the classic paradigm of an atemporal individualism which treated all other persons and things of the environment as positive or negative factors according to their potential for helping him achieve that goal.[50] The contemporary research of John Atkinson and Joel Raynor into task motivation follows a similar line of thought. Atkinson and Raynor discuss "contingent path theory" which shows that one is more highly motivated to complete a task that is meaningfully related to long-term goals.[51] Incorporation of long-term cultural goals into the education of the individual is vital, as we have discussed in our consideration of cultural aspiration, but as we have also pointed out, it must be a cultural aspiration cognizant of the historical complexity that surrounds everyone in the culture. Jean-Paul Sartre has criticized the lack of historical dimension in Lewin's studies largely because of the atemporal individualism that legislates against a cooperative interdependence.[52]

The second semester of the course is designed to reinforce particularly the notion of human proportion in research by heightening awareness of the researcher as a citizen. The semester begins with a three week presentation of the arts and sciences in a highly creative historical period, such as the Dutch Republic of the late 1500s and early 1600s, or Florence in the 1300s and 1400s. The presentation stresses the interaction between the social-economic, political, and religious values of the society, and the problems, themes and conventions of the artists, and the contributors to science. The individual solutions to problems in the arts and sciences are set against the background of public life, and the character of the lives of the individual contributors measured against the norms of that public life. In the month that follows this study, the second phase of the second semester, the students are directed towards library sources in contemporary culture which will help them identify artists and scientists who work within the locus of the problems touched upon by their first semester questions. With the model of the analysis of the historical period recently reviewed in mind, the class begins to construct a sense of our contemporary culture's social-economic, political, and religious values. The intensive study of how a creator in the arts or sciences has worked to further, augment, or change these normative values following questions which have been thoroughly integrated into the thinking of the student, enables the class to arrive at a fairly complex, open-ended picture of our culture. The dialogue between students, furthered by various group process techniques for stimulating the sharing of student work and thought in the construction of the societal model, lends to the student's education as potential citizen-researcher. The work of his chosen subject will be discussed by others in some of its potential environmental problems, and its necessary reliance on the work of other fields. The student will come to see how researchers in all fields share not only similar methodologies, but also some of the social pressures which guide their work. Insights into directions of potential research based upon cooperative efforts can emerge, as the students recognize the parallel paths of many fields. Economies that can be won through more thoughtful interdisciplinary work will become evident.

The horizon of the individual student in his historia has been widened through this thorough examination of how his particular interest, and those of his fellow students, are reinforced or constrained by the contemporary cultural norms. He has learned to emphathize with the efforts of contemporary researchers who seek to realize their own lives as thoughtful workers within this cultural setting. He has also seen how another period in Western cultural history raised similar tensions in the pursuit of knowledge. He has begun to see how the pursuit of knowledge also entails attitudes and actions that promote responsible citizenship. In the final phase of the second semester he will select a research project that deepens these understandings, and affords him the opportunity to demonstrate to himself and others that he can begin the same journey as the exemplary individuals he has studied.

Otto Rank's stress on action that enables the person to experience his own sense of agency and potency suggests how important the element of creative, independent research is in the student's education. The conclusion of the course must focus upon the student's synthesis of what he has experienced, and the exercise of the skills he has learned, in an extended research effort that balances his own questions and interest with a grasp of the interdisciplinary import of research in the Liberal Arts. Three types of projects are offered as vehicles for this synthesis. The first has a small group who share a similar question, which has been translated into disciplinary formulations in the humanities, social sciences, and natural sciences. They are asked to design quasi-experimental and experimental conditions in which evidence may be gathered that could begin to answer their major concern. The design is based upon the implementation of several methodologies central to the social sciences: the survey, behavioral observation, and performance of artifactual testing. These medthodologies are also used by researchers in the biological and medical sciences. If not self-evident, the value these methodologies may have for philosophers, historians, and others in the humanities will be demonstrated to the student whose major interest is in this domain, as he cooperates with his team members in the project. The team is guided in the development of several hypotheses with the aid of a workbook-text which then carries them step-by-step into the design and implementation of the research plan. Library research into the concepts of the hypotheses is included in the format, thus the humanist is given ample opportunity for a cultural-historical pre- and post-analysis of the research, which willl emphasize his integral importance as a representative of the humanities. The seven week scope of the project allows the use of class time for general and specific discussions of the student work. As the purpose of this research is to allow the student to exercise his ingenuity in differing environments in pursuit of his interest, thereby beginning his journey as a researcher, the evidence he gathers and the methodologies he employs are of instructive value and not meant to have the sophisticated or scientifically rigorous quality that he will come to achieve in his later studies. The errors he makes can school his self-direction for the refinement to come in the future.

The second alternative is a test of the model of contemporary culture in its effects upon the researcher in the humanities, social sciences, and natural sciences. The individual or small group constructs a survey instrument for an extensive oral interview that will probe the attitudes and actions of the researcher which respond to the pressures of contemporary cultural norms, and explore the researcher as a citizen of the research community and the public world. The questions will incorporate the student's repeated consideration of the major characteristics of disciplinary paradigms, and the manner in which the researcher employs them. The student's own cultural aspirations will provide a chrysalis for the questions directed towards the researcher's citizenship. The students will be given preliminary training in conducting an oral interview, with the help of a faculty member skilled in this form of research. The interviews will be analyzed, and commonalities and differences between the researchers will be presented for class discussions.

The third alternative will be for an individual or small group to construct a model of the socioeconomic, political, and religious values of a historical generation in Western culture, similar to that developed by the instructor at the beginning of the semester, and the students of contemporary culture. Within that model several researchers in the arts and sciences of that time will be studied in their interaction with the norms and with each other. The concept of the researcher as citizen of a research community and public world in a past generation will be a challenging problem, but one the student can manage in the light of his previous work. One possible format for the juxtaposition of the past thinker with his environment and fellows is a reconstruction which has that individual articulate the questions and reflections that accompanied his cultural creation. His purview of the possible bodies of knowledge that influenced his perspective and attitudes, the limits he may have seen in certain attempts at knowledge, and the avenues which promised the most exciting exploration, can be brought forth in first person monologue. Or, the student may create a dialogue with the historical person, testing in his imaginative conversation the time-bound quality of that person's questions, experimenting with the historical boundaries of the past person's relation to social and psychological problems. There exists a paradigmatic construct in intellectual history, sociology, and literary criticism, emanating from the time of Wilhelm Dilthey, which emphasizes the understanding one can gain of the past, and of oneself, in such a counterpoint with historical lives in imaginative dialogue.[53] The student may arrive at a historia that soundly integrates his own perceptions of the issues of his life, and his own path in the environment, through his approximation of the challenges faced by the historical person, and the means whereby that person responded in the pursuit of knowledge.

The guidance the instructor provides in carefully outlining the scope and steps of the final project is critical for the two semester historia. There must be an adequate consideration of the person-centered relation to the research so that the student's two semester pursuit of a personal question is not overwhelmed by the objective information or procedural tasks. The use of worksheets for each step of a project can insure the instructor and the student of the introspective element which balances the pursuit of knowledge with the reflection upon how the knowledge gained informs one's own cultural aspirations and view of life.

Similarly, the interdisciplinary focus of each of the projects must be supported through questions addressed by the instructor to the students as they develop each phase of their project. This is best done through a prior deliberation by the instructor of what will be involved in the research of each alternative. The reference back to issues studied over the two semesters will bolster the student's confidence in moving forward with original work. The Ariadne's thread of his past deliberations will help him meet in dialogue the living and historical researchers he encounters.

With these helpmeets that keep the person-centered and interdisciplinary pedagogy of the course in focus, the student will be free to test his powers, assured in the terrain he will cover. "We can deliberate about things that are in our power and can be done." The concept of locus of control, the modern version of Artistotle's dictum, has been shown to be critical for any academic success. One must feel and demonstrate ownership in any practice. There must be a habitual character to the performances. This habituation begins from a continuity of one's actual life in the environment. That is why the person-centered approach which grounds new learning in the student's past concerns is so vital. He must see the new rigor of academia as a refinement of his past goals and thoughts. This new culture must become an extension of his past culture. Even the cognitive skills he practices must be integrated into issues which touch his deepest thoughts, for then they are not mere exercises, but a strengthening of his mind to meet challenges that are significant to him. Whether he specializes in the future of a single field, or becomes an interdisciplinarian in his mix of learnings, he must conceive this academic endeavor as a study of human problems within an environment he has either experienced directly, or one that shares common human elements with his life environment. The consequences of his research must be seen as consequences that affect his life, and the lives for those who have their own concerns who share his world. His locus of control is basically within his awareness of how to effect his aims in the world. An education that allows him to incorporate his aims in the learning will enlist his entire commitment. The accurate empathy of others in his present, and in history, will grow from a human response rooted in his sense of personal competence to explore these issues, as he would in ordinary life if one could show him how he could grow through such an informed openness. His self-esteem, cultivated in his competence as a researcher, will have a correlation to the attributes of a humanist-scientist, an accomplishment of his empirical adventure. Socrates and the peripatetic school of learning cease to be historical artifacts as one considers how through intelligent questioning one can lay the foundation for an approach to the arts and sciences which moves the questioner as a whole person towards his future.

NOTES

[1] See Jonathan Broido, "Interdisciplinarity, Reflections on Methodology," in *Interdisciplinarity and Higher Education,* edited by Joseph J. Kockelmans (University Park: The Pennsylvania State University Press, 1979), p. 279; See also an excellent summary of Broido's theory of interdisciplinarity in the recent article by Julie Thompson Klein, "The Dialectic and Rhetoric of Disciplinarity and Interdisciplinarity," *Issues In Integrative Studies* 2 (1983) pp. 37-38.

[2] See Thomas C. Benson, "Five Arguments Against Interdisciplinary Studies," *Issues In Integrative Studies* 1 (1982), pp. 38-48.

[3] For a discussion of "generic" inquiry skills that are shared by the social sciences and humanities, see the following publications by Mark E. Blum and Stephen D. Spangehl, who offered the courses that are integral to the two semester course presented in this paper: 1) "College Program Built Around Cross-Disciplinary Competencies," *Competency Forum,* III (1978): 11-16; 2) *Ideas and Research: A Course Introducing Inquiry in the Social Sciences and Humanities* . ERIC (1978), ED 157 812; 3) *Identifying Skills and Developing Curricula in Academic Research: Rationale for a Competency-Oriented Curricula.* ERIC (1980), ED 183 118; "A Developmental General Education Course: Introducing Inquiry in the Social Sciences," *Journal of Developmental and Remedial Education* 4: 24-26; and 5) *Developmental Education and the University College: A Competency-Based Approach to Education.* ERIC (1978). ED 157-813.

[4] See a history of the concept of individuation, with recommended source readings, in *The Oxford English Dictionary,* Volume V. (London: Oxford at the Clarendon Press, 1983), p. 225.

[5] St. Thomas Aquinas, *Summa Theologiae,* Vol. I. (London: Blackfriars, 1963), pp. 89-90.

[6] Aristotle, *Topics,* Book I, Chapter 2.

[7] Immanuel Kant's *Critique of Pure Reason,* translated by Norman Kemp Smith. (New York: Macmillan, 1968), pp. 645-655.

[8] Immanuel Kant, *Critique of Pure Reason,* p. 656.

[9] Immanuel Kant, *Critique of Pure Reason,* p. 656.

[10] Werner Heisenberg, *Physics and Beyond, Encounters and Conversations,* translated from the German by Arnold J. Pomerans. (New York: Harper Torchbooks, 1972).

[11] Werner Heisenberg, *Physics and Beyond*, p. vii.

[12] For a capsule review of the influence of diverse fields of the humanities on Sigmund Freud, see Ernest Jones, *The Life Work of Sigmund Freud* , edited and abridged in one volume by Lionel Trilling and Steven Marcus. (New York: Doubleday Anchor, 1963), Chapters 3 and 4. An excellent review in more depth, although a work of fiction (thoroughly researched for factual detail) is Irving Stone, *The Passions of the Mind, A Biographical Novel of Sigmund Freud.* (New York: New American Library, 1971).

[13] See especially Sigmund Freud, *The Origins of Psychoanalysis, Letters to Wilhelm Fliess*, translated by Eric Mosbacher and James Strachey. (New York: Basic Books, 1954); for the formative influence of Freud's explicit interdisciplinary interests by his conversation circle, see Sigmund Freud, *On the History of the Psycho-Analytic Movement*, translated by Joan Riviere, revised and edited by James Strachey. (New York: Nortin, 1966), pp. 36-37.

[14] See Sigmund Freud, *An Autobiographical Study*, translated by James Strachey. (New York: Norton, 1952), pp. 41-42; and, Josef Breuer and Sigmund Freud, *Studies on Hysteria*, translated and edited by James Strachey. (New York: Basic Books, N.D.), pp. xxi-xxiv.

[15] See Ernest Jones, *The Life and Work of Sigmund Freud*, pp. 143-144 for a discussion of Joseph Beruer's counter-transference to "Anna O." his fear of the patient, and the form of therapy in the wake of that counter-transference of which he was unaware.

[16] Immanuel Kant, *Critique of Pure Reason*, p. 323.

[17] See Werner Jaeger, *Paideia, The Ideals of Greek Culture*, Volume I, translated from the German by Gilbert Highet (New York: Oxford University Press, 1974), pp. 155, 179, 294, and 382. Jaeger does not allow the person-centered aspect of the inquiry. However, see Hermann Frankel, "Xenophanes' Empiricism and His Critique of Knowledge (B34)," in *The Pre-Socratics, A Collection of Critical Essays*, edited by Alexander P. D. Mourelatos (Garden City, New York: Anchor Press, 1974), p. 125 where the notion that led to the concept is formulated by Xenophanes. Knowing from one's own experience, seeing for oneself; and the unity of vision that led to the understanding of the individual in a world of uniform law was credited to Xenophanes by Aristotle, *Metaphysics* A, 5, 986 b 21. Herodotus further developed the concept through his historia (history) which traced the causes of the political events which conditioned individual life, but which emanated in individual judgment; see Frankel, *Ibid.*, p. 125.

[18] John Burnet, *Early Greek Philosophy*, Fourth Edition (London: Adam & Charles Black, 1945), pp. 140, 141.

[19] The movement of the concept from physical research to the study of human events, or "history," relied on a synthesis of facts and critique of tradition that created a unified interpretation of the interrelations of events and their guiding cause; see Jaeger, *Paideia*, p. 382. He says of the Greek historian Hecataeus, who preceded Herodotus: "As far as we know, Hecataeus (who came like the first great physicists from Miletus . . .) was the first to transfer his 'investigation' from the whole of nature to one special field, the inhabited earth . . . .His account of the countries and peoples of the world, a remarkable blend of empirical knowledge and logical hypothesis, if taken together with his

genealogical studies and his rationalist criticism of mythology . . . was also a precondition for the rise of history."

[20] Aristotle, *Physics*, Book B, 1-3.

[21] See for example on Dante's modern significance, "Editor's Instruction," *The Portable Dante*, edited by Paolo Milano. (New York: Viking Press, 1974), pp. xxxix-xi.

[22] See Leon Battista Alberti, *On Painting*, translated by John R. Spencer. (New Haven: Yale University Press, 1966).

[23] One may see the deepest extension of the mathematical disappearing point which carries the eye into a secular, infinite world, within the orthodox theory of Alberti, in Raphael's *School of Athens*; see "Introduction," *On Painting*, p. 31. Representational painting since the Albertian perspective of the Italian Renaissance has varied the depth of field, but adheres essentially to his understanding of the unified theme which orders empirical reality, and the notion of a singular meaning of the momentary vision of events.

[24] Aristotle, *Nichomachean Ethics,* Book III, 3, 1112a, 30.

[25] Immanuel Kant, "What is Enlightenment?" in *On History*, edited by Lewis White Beck. (New York: Bobs-Merrill, The Library of Liberal Arts, 1963), p. 3.

[26] See Mark E. Blum and Stephen D. Spangehl, *Developing Educational Programs for the High Risk Secondary School and College Student.* (New York: University, ERIC/CUE Urban Diversity Series 80, 1982).

[27] Mark E. Blum and Stephen D. Spangehl, *Developing Educational Programs*, pp. 5-8.

[28] Raymond B. Cattell, *Abilities: Their Structure, Growth, and Action.* (Boston: Houghton Mifflin, 1971), p. 10.

[29] Mark E. Blum and Stephen D. Spangehl, *Developing Educational Programs*, p. 9-11.

[30] John W. Atkinson and Joel O. Raynor, *Personality, Motivation, and Achievement.* (New York: John Wiley & Sons, 1978).

[31] Otto Rank, "Fate and Self-Determination," in *The Self, Explorations in Personal Growth*, edited by Clark E. Moustakas. (New York: Harper & Row, 1956), p. 73.

[32] See Mark E. Blum and Stephen D. Spangehl, *Introduction to the Social Sciences: Teacher's Manual and Text.* ERIC (1981). ED 200 474, pp. 11-21, for an example of an evaluation system that works with acts of "self-determination."

[33] See Mark E. Blum and Stephen D. Spangehl, "Individualizing Instruction With Worksheets," *One to One. Journal of International Congress for Individualized Instruction*, 1 (November, 1978): 11-13.

[34] Mark E. Blum and Stephen D. Spangehl, *Developing Educational Programs*, pp. 12-14. For the best primary sources on this concept see Samuel S. Peng, Cecille E. Stafford, and Robin J. Talbert, *National Longitudinal Study: Review and Annotation of Study Reports* (Research Triangle Park: Center for Educational Research and Evaluation, Research Triangle Institute, 1977); the concept was brought to public attention by the Coleman report in 1966; see James S. Coleman et al., *Equality of Educational Opportunity* (Washington, D.C.: Resources in Education, 1966) (ED 012275). When self-esteem is high, but not congruent with the competencies that support the factual basis of a perception of competency, there is no academic success; see J. G. Bachman, P. M. O'Malley, and J. Johnson, *Adolescence to Adulthood: Change and Stability in the Lives of Young Men* (Ann Arbor: University of Michigan, Institute for Social Research, 1978). Congruence between self-esteem, a sense of high locus of control, and competent achievement in academia is best reached by programs that combine study and work, creating a more serious attitude in the student; see Anthony J. Conger, Samuel S. Dunteman, and George H. Dunteman, *National Longitudinal Study of the High School Class of 1972: Group Profiles on Self-Esteem* (Washington, D.C.: Office of Education, 1977). The conduct of research may be seen as an integration of study and related work.

[35] Mark E. Blum and Stephen D. Spangehl, *Developing Educational Programs*, p. 13.

[36] The extended research project in the second semester, and the shorter project at the end of the first semester may qualify this course for laboratory credit. The cooperation with developmental laboratory courses in critical thinking, or other skills that require additional development in the student would also qualify the course for possible, supplementary credit.

[37] See American Association of State Colleges and Universities, *Connections*, Vol. 2, No. 1 (May, 1980), and Vol. 2, No. 2 (November, 1980).

[38] See American Association of State Colleges and Universities, *Connections*, May, 1980, pp. 5-6.

[39] American Association of State Colleges and Universities, *Connections*, May, 1980, p. 6.

[40] Mark E. Blum and Stephen D. Spangehl, *Introduction to the Social Sciences: Teacher's Manual and Text.* ERIC (1981). ED 200 474; the test is programmed through 19 units that span one semester, designed to allow self-managed research. The library text is printed locally through the University of Louisville; it, too, is designed as a programmed, self-managed research text.

[41] See John W. Thomas, *Varieties of Cognitive Skills: Taxonomies and Models of Intellect* (Philadelphia: Research for Better Schools, 1972), pp. 13-17.

[42] H. D. F. Kitto, *The Greeks* (Baltimore: Penguin Books, 1951), p. 172.

[43] Immanuel Kant, *Religion within the Limits of Reason Alone*, translated by Theodore M. Greene and Hoyt H. Hudson (Chicago: Open Court Publishing Co., 1934), p. 176.

[44] Jonathan Broido, "Interdisciplinarity, Reflections on Methodology," pp. 278-279.

[45] See Mark E. Blum and Stephen D. Spahgehl, "Individualizing Instruction With Worksheets," pp. 11-13.

[46] Mark E. Blum and Stephen D. Spahgehl, *Developing Educational Programs*, pp. 9-11.

[47] Plato, "Symposium," *Great Dialogues of Plato*, translated by W. H. D. Rouse. (New York: New American Library, 1956), p. 94.

[48] See Ernest Jones, *The Life and Work of Sigmund Freud*, p. 229, n. 4.

[49] Immanuel Kant, *Fundamental Principles of the Metaphysics of Morals*, translated by Thomas K. Abbott. (Indianapolis: Bobbs-Merrill, 1949), pp. 14-15.

[50] See Kurt Lewis, *Principles of Topological Psychology*, translated by Fritz Heider. (New York: McGraw-Hill, 1936).

[51] See John W. Atkinson and Joel O. Raynor, *Personality, Motivation, and Achievement*.

[52] See Jean-Paul Sartre, *Search for a Method*, translated from the French by Hazel E. Barnes. (New York: Alfred A. Knopf, 1967), pp. 68-70.

[53] See Mark E. Blum, "Dialogue With Autobiography: Integrating Through the Study of Personality," *Issues in Integrative Studies* 2 (1983), pp. 76-78.

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INTERDISCIPLINARITY AND DIALECTICS: INTEGRATIVE CONCEPTS AND METHODS IN HEGEL'S *PHENOMENOLOGY OF SPIRIT*

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> The absolute Idea has shown itself to be the identity of the theoretical and the practical Idea....The Notion is not merely *soul*, but free subjective Notion that is for itself and therefore possesses *personality*...but which, nonetheless, is not exclusive individuality, but explicitly universality....All else is error, confusion, opinion, endeavour, caprice and transitoriness; the absolute Idea alone is *being*, imperishable *life, self-knowing truth*, and is *all truth*.
>
> Hegel, *Logic*

In 1806, G.W.F. Hegel completed his *Phenomenology of Spirit*. This work, which Hegel created as an introduction to his philosophic system, re-established the dialectical method in western thought. Dialectics originated with the ancient Greeks, and was directed to the achievement of knowledge as an integrated system. It was easier, however, for the ancients to give credence to such a system than for Hegel and his contemporaries, since in the intervening ages philosophy had split into the various natural and human sciences. Moreover, knowledge itself seemed irreparably divided by the Cartesian dualism of subject and object, *res cogitans* and *res extensa*. Hegel, however, could not accept the fragmentation of knowledge, and of experience itself, as the final word. Although he did not use the term "interdisciplinary," Hegel used the dialectical method to create an interdisciplinary system. He sought unity--not by ignoring differences, as his friend Schelling increasingly did, but by the mediation of differences.[1] In this way Hegel hoped to preserve the wealth of specific, organized information developed by the particular sciences, yet not be bound by their implicit assumptions and presumed boundaries. The *Phenomenology* attempts to demonstrate the possibility of an integrated system by deriving the principles necessary to its construction. As such, it stands as a classic of interdisciplinary thought.

In the final chapter, "Absolute Knowledge," Hegel outlines the philosophic foundations of integrative science. Absolute knowledge is knowledge conceived as an organic process in which the essential components are not academic disciplines or atomistic elements, but world-views identified by phenomenology of world history. Though divisions of knowledge do appear in the final chapter, they do so in order to be cancelled as forms of false consciousness, preserved in their substantial contributions, and sublimated to increasingly comprehensive expressions of wholeness. Thus we can interpret absolute knowledge as a philosophic meditation on the articulated unity of the particular sciences. Even the final apparent divisions of knowledge into history, phenomenology, and absolute knowledge, which Hegel himself introduces, are no sundering of unity, but moments in the process of its development. They are to be understood not as areas or "parts," but as stages. History provides the raw material, the basic data; phenomenology provides the discipline of observation that allows the data to be uncovered and interpreted; absolute knowledge is the systematized and unified result.[2] This knowledge is not even limited to integration at the level of theory; it subsumes modes of historical action as well. Put another way, the dialectic develops on three planes: that of *theoria*, that of *praxis*, and that of the *absolute*, which represents the union of the two. When Hegel declares that "the truth is the whole," he is calling for the most radical form of integrated thinking since Plato.[3]

To achieve this ambitious project, Hegel had to redefine the basic tools of thought: concepts, experience, even logic itself. As early as the Preface to the *Phenomenology*, Hegel warns that true knowledge cannot be expressed in the form of ideas or formulas abstracted from experience. Truth results from the fusion of ideas with the experiences they reflect and comprehend:

> a so-called fundamental proposition or first principle of philosophy, even if it is true, is yet nonetheless false just because and insofar as it is merely a fundamental proposition, merely a first principle.[4]

He applies the same judgement to all abstractions. Hegel asks that isolated ideas be transformed into Concepts (*Begriffe*) or Ideas by combining the particular abstraction with its logical and historical context. Thus through the course of the *Phenomenology* Hegel works toward increasingly comprehensive concepts: spirit, reason, temporality, science. Their content and relations appear mystical from the point of view of common sense, which clings to abstract ideas and sporadic observations, and therefore dooms itself to vagueness and misplaced concreteness.[5] But the new concepts prove to be concrete and determinate when seen in relation to their historical origins and to the system as a whole.

The validity of Hegel's concepts cannot depend on mere textbook history, however, which Hegel sees as a chaotic mixture of truth and circumstance. Instead, it depends on the phenomenology of the ways human existence appears and organizes itself in and through history. The whole *Phenomenology*, then, is an historical demonstration of Hegel's final assertions about spirit, self-consciousness, time and the absolute.[6] Those conclusions are at one and the same time a recollection of the sciences and world-concepts of the past, and a formulation of the articulated unity of those sciences. In absolute knowledge, art, religion, philosophy, and politics are conjoined. The vagueness that enters the work in this final moment is generated by the difficulty of preserving an encyclopedic multiplicity within a substantive unity. Modern generalists and interdisciplinarians can easily sympathize with this problem.

In addition to redefining concepts and their relation to history, Hegel reconstructs logic itself. Some aspects of this effort are well known. Hegel realized that philosophy had inherited a static conception of truth, enthroned in a formalistic logic. Static categories made it impossible to understand change, or any changing phenomenon: organic growth, political revolution, psychological development. Hegel responded to this situation by creating a new logic based on contradiction rather than identity. In dialectical logic, contradictions combine and interact, forming new concepts at a higher level of complexity. These in turn give rise to new contradictions and new fusions. Thought is thus infused with motion. Truth itself develops and evolves toward wholeness; concepts become flexible and multi-dimensional, without losing their character as indicators of essential qualities. Essences now participate in existence, and being in becoming. The comprehensive concept finds its proper context in logical structures progressing toward comprehensiveness.

The new logic has a tremendous range of applications. We find Hegel applying it to experiential problems, historical ages, even individual cultural artifacts. Who would expect the relationship between master and slave to have an internal logic, a metaphysics, an organic structure expressible in terms of principle and contradiction, consciousness and self-consciousness? Who would expect dramatic works such as *Hamlet* and *Orestes*, or architectural achievements like the Parthenon, to find their way into a discussion of religion as necessary aspects of its definition and development? This kind of radical conjunction is based on Hegel's discovery that experiences reveal an inner "logic" if approached in the right way. Even the mundane and the irrational often prove to have a hidden rationality. World-views have structures that can be thought, and through thought connected to one another. The same is true of human activity. Action presupposes a world-view, a world-design, in which human activity has meaning and context. Action, then, no matter how concrete and mundane, is also a type of experience that can be grasped in thought and logically systematized.

Hegel's assertion is not, however, that abstract logical forms rule experience, or that all experiences have equal metaphysical significance.[7] Not all experiences receive the same kind of attention in *The Phenomenology of Spirit*, and many don't appear at all. Hegel has concentrated on those phenomena which arise in an historical overview, and show themselves to be necessary in articulating and solving the fundamental problems of human existence. What's more, the logic he introduces is derived from an existential rather than an essentialist standpoint. The world-structures he discovers are not eternal laws writ in the fabric of things (for this would return us to an inert formalism), but possibilities consciousness discovers within itself as "being in the world." In fact, for Hegel the possibility of knowledge, and of systematic knowledge, depends on creating a logic derived from subjective experiences as well as from "objective" discoveries. Reality must be *subject* as well as *substance* if the breaches in knowledge are to be healed.[8]

Thus another fundamental redefinition is necessary for the construction of a comprehensive, interdisciplinary science: a redefinition of the subject. Hegel finds that he and his generation have a unique opportunity. The maturation of history, as a discipline and a form of knowledge, can expand all of the subject's powers of mental assimilation and integration. Hegel sees a way out of the subject/object dualism plaguing the sciences, and the "abstract thought versus concrete experience" dualism plaguing every reflective person. The solution involves the historical discovery that the intellectual boundaries consciousness must transcend are boundaries which it has posited in the first place. What consciousness has done it can undo. It is by recognizing the subject as actively engaged in constructing and mastering his world that Hegel overcomes the subject/object disruption of the world, and establishes the possibility of integrative knowledge.

The importance of the subject modifies Hegel's approach in other ways as well. Too often commentators defuse the active, integrative force of Hegel's method by substituting the bare term "synthesis" for the actual labor of synthesis. Hegel calls for the unification of all cultural realms, but finds that this can only take place through the active, laboring individual. Thus there is nothing automatic or "given" about synthesis. For an abstract thinker, strict definitions are the essence of thought; concepts must be purged of empirical and personal aspects, they must become totally generic. Within this framework, even synthesis must remain an abstract formal activity. Hegel, on the other hand, allows the empirical shapes and personal forms which concepts assume within particular situations to qualify the concepts themselves. Thus synthesis *can be observed taking place* when individuals make existential choices, and when world-historical individuals redirect whole traditions.[9] Hegel's idea of opposition and synthesis has affinities, then, with the modern sociologist's or anthropologist's conception of "society" or "culture" as a webwork of structural/functional relationships changing through time. Despite the usual bows to scientific empiricism, a careful sociologist realizes that abstractions like "family," "class," and "individual" can become part of a dynamic invocation of the actual shape of life, if we abandon strict definitions and work out the situational meanings of the terms. But this means placing new emphasis on the individual, in all his concreteness and particularity, as an actor and as a knower. When we do, we can see synthesis taking place, and need only translate the phenomenon into appropriate theoretical terms.

This comparison with social science underscores an important point. For Hegel, the process of cumulative synthesis which yields unitary science must prove itself in two important ways. It must be based on radical empiricism, and it must subject itself to the test of a thoroughgoing scepticism. By treating subjectivity as simply another phenomenon to be studied, Hegel becomes more empirical than the empiricists, who tended, then as now, to ignore the impact of their own status as subjects on the objects they study. Kant had already established the need for a critique of scientific reason, and Hegel sees himself as extending and completing that critique. Kant hoped his critique would finally give the various sciences a firm philosophic foundation, and here too Hegel is simply continuing Kant's efforts. In addition, Hegel hopes to overcome scepticism by incorporating it. Every position he encounters or develops, he subjects to a thoroughgoing critique. This moment of negation is so important to Hegel that it becomes part of his logic, and part of his definition of subjectivity's powers.[10] Radical empiricism conjoined with radical scepticism is what Hegel means by the phenomenological method. The result is a mode of thought which progressively comprehends the immediate (in the sense of empirical phenomena), the multiple forms of cultural mediation and synthesis, and the final syntheses achieved by the concrete human subject. The process can be thought of as an expansion of subjectivity, or consciousness, to include many world views, first individually, one "world" at a time, then as a group, and finally as contributors to an architectonic system.

The validity of Hegel's system rests, then, on two inter-related proofs: that subjectivity can be an object of study, and that subjectivity is capable of radical extension and transformation. Put another way, the dialectic depends on proving that subjectivity itself is dialectical in nature. The *Phenomenology* attempts this demonstration by describing the modes of subjectivity that have appeared over the recoverable span of human history. Hegel concludes that thought itself--the power of reflection--has driven subjectivity into a painful process of growth and evolution. Thought is the inherent daemonic principle that plagues and prods the individual into creating, negating, and re-creating cultural forms. As one commentator put it:

> Reflection is the principle of absolute dialectical unrest and ontological instability at the womb of being, and dialectic is thus the way man wages war with himself and permanent debate with what merely is....The only correspondence which can satisfy consciousness is correspondence with itself, the dynamic correspondence of subject which rejects any cessation of activity....[11]

Reflection linked with action has the power to dissolve the world as it immediately presents itself, and to reinstate it on a new foundation. Hegel is, undoubtedly, an idealist. But his idealism is of a highly qualified sort. He never denies that the world, or the individual object of perception, begins as external to the knower. But objects need not remain merely as we find them. Thus Hegel views the domestication of the world by knowledge and work to have ontological status: it transforms and humanizes the world, and makes it available for complete, certain, and scientific knowledge. Reflection, linked with the praxis that grows from it, becomes the "ontological instability" that reorganizes reality itself.

Because there are no inherent limits to reflection, Hegel pushes its significance as far as he can. He concludes that humanity is able, potentially, to determine and arbitrate its world and its own existence. In the heady atmosphere of absolute consciousness, we *become* being and time. It is precisely because the human incorporates the ontological--in the sense that "existence precedes essence"--that a final mediation between subject and object, thought and world is possible. The goal and the basis of Hegel's whole system, then, is a new kind of individual, reflectively aware of his world and his possibilities, and thus able to live *ontologically*.

In a way, the discovery by consciousness that its primordial self is reflection, and that reflection is inherently infinite in its capacities and demands, *is* absolute knowledge: for in this self-appraisal consciousness understands itself and its capacity to recollect and assimilate all human experience. In another sense, however, absolute knowledge only *becomes* possible with this discovery, since the subject must now turn back, understand humanity's early achievements and failures, and develop them into a comprehensive system. Hegel's interpretation of subjectivity is the result of his phenomenology, but not its final result; for this discovery initiates a return to the phenomena with the absolute perspective as a firm possession of the philosophic observer.

Having redefined subjectivity, Hegel must in turn redefine intersubjectivity. In the course of mind's historical progression, the subject encounters objects, and even systems of objects. But it also encounters other subjects. The result is not immediate recognition, but a complex struggle. Recognition, however, is another way in which subjectivity can expand itself. Thus consciousness evolves toward a community of free, mutually aware subjects. Hegel calls this world-design "spirit":

> this absolute substance, which is the unity of the different self-related and self-existent self-consciousnesses in the perfect freedom and independence of their opposition as component elements of that substance: Ego that is "we," a plurality of Egos, and "we" that is a single Ego. Consciousness first finds in self-consciousness--the notion of *Geist* [spirit]--its turning point...and steps into the spiritual daylight of the present.[12]

Spirit is reflection in the form of a living, self-conscious community. It is politics conceived of as thought and action conjoined. In the course of the *Phenomenology* Hegel introduces such concrete social and political forms as the state, civil society, the bourgeoisie, labor. In the final synthetic chapters, these forms do not explicitly reappear. Yet they are preserved implicitly, as the *action* of "spirit certain of itself," or "conscience." This type of personality, with his characteristic "world-spirit," ties together the concrete realms of civil society and the state by making them self-conscious actions rather than external, passively accepted institutions. This is synthesis by means of praxis, which then *becomes* a new synthesis on the theoretical level:

> The "fact itself" has substantiality in general in the ethical order, external existence in culture, self-knowing essence of thought in morality; and in conscience it is the Subject, which knows these moments within itself.[13]

Spirit, then, finds its authentic existence as a self-conscious community in which each individual, certain of himself as free subjectivity, joins with other individuals in a political unity. Spirit is a particular mode of social existence. But it is also a mode of knowledge. The unity of the egos in their active lives makes possible a unity of differentiated sciences, arts, and skills as well, according to the same dialectical principle. The individuals unify by achieving mutual recognition as free and universal "spirits." The sciences come together when spirit is seen to underlie all cultural creations. Since man creates culture in all its multiplicity, man himself is the unity behind the multiplicity. When all sciences are seen as outgrowths of spirit, they can be reformulated to reflect that initial unity. Spirit is, then, both implicit in the sciences from the beginning, and made explicit as the final result of theoretical activity.

Once spirit shows itself to be the underlying principle of culture, we realize that only spirit as a whole has a history and makes history possible.[14] There is now no separate history of philosophy, law, medicine, physics, or whatever. They all arise from the same principle and embody it, no matter how complex and internally differentiated that embodiment may become. Their independence is both cancelled, as *substantive* distinction, and preserved, in the form of simple distinctions within a systematic whole.

The complex and fluid nature of this synthetic process is best captured in Hegel's own words:

> ...the arrangement now assumed by the forms and shapes which have thus far appeared, is different from the way they appeared in their own order....In the series we considered, each moment, exhaustively elaborating its entire content, evolved and formed itself into a single whole within its own peculiar principle. And knowledge was the inner depth, or the spirit, wherein the moments, having no subsistence of their own, possessed their substance. This substance, however, has now at length made its appearance; it is the deep life of spirit certain of itself; it does not allow the principle belonging to each individual form to get isolated, and become a whole within itself: rather it collects all these moments into its own content, keeps them together, and advances with this total wealth of its concrete actual spirit; while all its particular moments take into themselves and receive together in common the like determinate character of the whole.[15]

Hegel makes it clear that this new development entails the structural reorganization of the world-concepts that have appeared in the course of the dialectic:

> Thus while the previous linear series in its advance marked the retrogressive steps in it by knots, but thence went forward again in one linear stretch, it is now, as it were, broken at these knots, these universal moments, and falls asunder into many lines, which, being bound together into a single bundle, combine at the same time symmetically, so that the similar distinctions, in which each separately took shape within its own sphere, meet together.[16]

These passages indicate a new transparency of moments occurring in the final stages of Hegel's dialectic. It takes place explicitly in formulations like the above, and implicitly by allusion to the world-views that must now be drawn up and incorporated into the final system. The structure of allusions makes each world-view complete and transparent, so that all can be seen and known simultaneously. This is something like Levi-Strauss' conception of the multidimensional, interconnected structure of meanings to be found by the study of comparative mythology. But in Hegel structure and dynamics (both in logic and in phenomena) must be more completely reconciled:

> For the rest, it is self-evident from the whole argument, how this co-ordination of universal directions, just mentioned, is to be understood; so that it becomes superfluous to remark that these distinctions are to be taken to mean essentially and only moments of the process of development, not parts. In the case of actual concrete spirit they are attributes of its substance; in religion, on the other hand, they are only predicates of the subject. In the same way, indeed, all forms in general are, in themselves for us, contained in spirit and contained in every spirit.[17]

Hegel's solution seems simple enough in principle. By positing subject as of equal ontological status with substance, Hegel sets the stage for subject's mastery of substance through labor and thought. The synthesis here is more fundamental, perhaps, but is no different from the syntheses spirit achieves in all its relations. But the resolution is complex in execution and filled with ambiguities. Hegel gathers together the universal truths that have emerged within each "shape" the world has assumed for consciousness. But these truths emerged from contradictions, and Hegel draws up those contradictions as well. Rather than merely gathering universals in an additive fashion, absolute knowledge incorporates universals still embedded in essential conflicts. Absolute knowledge, then, as a new world-design, faces a number of tasks:

1. It must be the fulfillment of freedom, and therefore the supercession of all forms of dependence and necessity.

2. It must fully establish the liberty and fraternity of all self-conscious beings.

3. It must abolish all substantial otherness, yet ground the "substantiality" of the world.

4. In a parallel way, it must abolish all alien self-consciousness--that is, announce the "death of God" and yet preserve the force of the divine.

5. It must resolve the conflict between family and state as universal forces.

6. It must relate particularity and universality within the individual.

7. It must overcome the conflict within one's universality between thought and action.

8. It must abolish all forms of "false consciousness"--all partial perspectives--in a comprehensive and systematic grasp of reality as a unified "field" of meaning.

These conflicts have been preserved in the dialectic, and now appear as a unified problematic. Rather than a mere collection of problems, absolute knowledge confronts a system of problems. Note that each conflict emerged as part of a "world"--a unified way of life--and is thus already a conflict beyond the perspective of any single academic discipline. The aspect of "preservation" in the term synthesis refers, in this regard, to the uplifting of contradictions within these world-structures rather than their simple resolution within each individual structure.

This fact can be a source of confusion. The labor of subjectivity is necessary at every point in the *Phenomenology*, and as a true labor it changes the nature of each problem. These transformations sometimes appear to be final resolutions: the "Unhappy Consciousness" seems to have completely disappearred in "Reason as Observer," with its special kind of self-confidence. But the truth of the "Unhappy Consciousness," the inner conflict between particularity and universality, reappears in other forms. Truth keeps appearing in the form of contradiction. Yet it cannot remain in that form.

Once again, the solution results from the power of reflection. Since subjectivity has proven to be the historical ground of contradiction itself, it can in principle cancel it out. In terms of concrete existence, or praxis, this means creating a civilization in which contradictions left over from earlier stages of social development are resolved in new institutions and social relations. In terms of theory, it means developing an extension of social thought in which the contradictions retain only relativistic truth, and take their place as distinctions within the extended theory. The way Newtonian mechanics has been both superceded and preserved in contemporary physics is a good example of the process Hegel has in mind.

The resolution of the problematic is, then, a unified "wisdom" resulting from a fusion of world-designs, of actual ways of life embodied in historical examples. The fusion recasts recurrent problems, and resolves them by the creation of a comprehensive world-view, which Hegel calls Science, and an authentic mode of existence.[18]

The dialectic now interweaves the two basic themes, the actional and the theoretical, in a new way. Absolute knowledge depends upon the existence of a special kind of community, the modern state. Hegel sees that community taking form, primarily through the political and military achievements of Napoleon.[19] The Emporer's major work, in Hegel's view, is the stabilization and institutionalization of the French Revolution. The result is a commonwealth that contains revolutionary (and thus dialectical) principles within its own structure. Only such a "revolutionary" commonwealth can resolve the eight problems and all the correlative tasks inherent in the absolute.[20]

What were conflicts become conditions and coordinations. Thus the reality of distinction and process is never completely lost, even when we have achieved Hegel's "absolute." The struggle for recognition, which began as a struggle to the death and evolved into the oft-cited master-slave relationship, is repeated and preserved as a stage in the education of every citizen. The confrontation between owner and worker becomes a coordination of labor and administration, mediated by public authority. Spirit is made to exist in the daily life of the political community, as well as in the theoretical reflections on that life. The existence of systematic knowledge is related to and dependent on its enactment in a political system. That final fusion of knowledge and ethical action completes absolute knowledge as a world-view grounded in a humanized world. It dialactically reveals the result of reflection's slow permeation and mastery of its world. It delivers to the individual the result of the historical experiences of the species. When this occurs in absolute knowledge, it constitutes the final achievement of the dialectical process: the vision of our full selfhood as world-historical spirit. This depends on a rare and radical effort of recollection, directed not only toward narrative history, but toward our deepest ontological soundings in moments of existential choice and action. Thus absolute knowledge is only in one sense the creation of a unified science. It is also a new form of immediate consciousness, a new spiritual community, and a new way of life:[21]

> Absolute Spirit...turns to itself, to its own peculiar world, in the actual present....It thus discovers this world in the living present to be its own property; and so has taken the first step to descend from the ideal intelligible world, or rather to quicken the abstract element of the intelligible world with concrete selfhood.[22]

Once absolute knowledge has emerged as a world-view--the "last embodiment of spirit"[23]--it can then be expressed as an abstract system. This is why the *Phenomenology* remains, for all its length and complexity, an introduction to the Hegelian philosophy. Yet in some respects it is more than an introduction, since in presenting absolute knowledge as a mode of self-consciousness Hegel has already sketched out the abstractions from which the final system will coalesce. The task of building the complete integrative system is clearly announced in the concluding chapter of the *Phenomenology*, and carried out in the *Logic*, the *Encyclopedia of the Philosophical Sciences*, and the other works of Hegel's philosophic maturity. There Hegel reformulates the specific disciplines with which we are familiar. But all of these later studies rest on the principles Hegel uncovers and tests in his *Phenomenology of Spirit*.

The Hegelian approach became quite influential during Hegel's lifetime, and in the period immediately following his death in 1831. But eventually the Hegelian school lost its coherence and much of its intellectual force. Hegel was severly criticized by scholars who found his method suspect and his final system unacceptable. Much of the criticism, however, was directed at the Hegel of the *Logic*, without a preliminary understanding of the phenomenological principles that make the *Logic* possible. More recently, scholars have found new coherence and relevance in Hegel's work. By pioneering the search for integrative knowledge, Hegel proves himself to be our intellectual contemporary. The same rejection of fragmentation that he stated so forcefully now motivates the interdisciplinary movement. To the modern interdisciplinary scholar, Hegel offers metaphysical grounds for unitary science, and a methodology carefully conceived and consistently applied. His efforts, adapted to our own needs, can make a significant contribution to interdisciplinary thought.

NOTES

[1] G.W.F. Hegel, *The Phenomenology of Mind*, trans. J. B. Baillie (New York: Harper & Row, 1967), pp. 77-79.

[2] *Ibid.*, p. 808.

[3] *Ibid*, p. 81.

[4] *Ibid.*, p. 85.

[5] A. N. Whitehead, *Science and the Modern World* (New York: Mentor, 1954), pp. 52-57.

[6] Hegel, *Phenomenology*, p. 80.

[7] Herbert Marcuse, *Reason and Revolution* (Boston: Beacon Press, 1960), p. 25.

[8] Hegel, *Phenomenology*, p. 80.

[9] Georg Lukas, *The Young Hegel*, trans. Rodney Livingstone (Cambridge: MIT Press, 1976), pp. 136-37.

[10] Hegel, *Phenomenology*, pp. 136-37.

[11] Walter Davis, personal communication.

[12] Hegel, *Phenomology*, p. 227.

[13] *Ibid.*, pp. 651-52.

[14] Lukas, *The Young Hegel*, p. 466.

[15] Hegel, *Phenomenology*, p. 691.

[16] *Ibid.*, p. 692.

[17] *Ibid.*

[18] *Ibid.*, p. 801.

[19] Guy V. Beckwith, "Praxis and Authenticity" (Ph.D. dissertation, University of California, 1978), chap. 2.

[20] *Ibid.*, pp. 33-37.

[21] Hegel, *Phenomenology*, pp. 796-97.

[22] *Ibid.*; p. 802.

[23] *Ibid.*, p. 797.

TRANSDISCIPLINARY PRINCIPLES AND PROCESSES INHERENT IN THE EVOLUTION OF COMPLEX SYSTEMS

Robert J. Williams

Transdisciplinary Principles

This paper was initially inspired by Robert W. Winquist's article "What Are Transdisciplinary Principles?" which appeared in the 1982 *Issues in Integrative Studies*. "Transdisciplinarity," Dr. Winquist says, "is built on the premise that there are discernible principles and purposes which underlie the entire knowledge/knower system." He goes on to amplify this definition by citing Kirtley Mather's "rationale for a transdisciplinary approach to the integration of the liberal arts curriculum." In Mather's words,

> . . . important is the search for basic concepts and underlying principles that may be valid throughout the entire body of knowledge, that serve as the common roots from which the various branches draw their vitality . . . . Integrative studies for general education must involve the quest for basic concepts and underlying principles. Such studies must go down to the very roots of the tree of knowledge; they must deal with the structures of the universe and its fundamental directives.[1]

Mather's mandate, of course, has been echoed by a vast number of scientists and teachers during the last twenty years. Ludwig Bertalanffy, for example, envisioned General System Theory as a paradigm that might successfully develop "unifying principles running 'vertically' through the universe of the individual sciences." "This," Bertalanffy asserted, "can lead to a much-needed integration in scientific education."[2]

Eric Jantsch, a system theorist associated for many years with the Center for Research in Management at UC Berkeley, was also deeply committed to a lifelong exploration of the meaning and relevance of "general laws of the dynamics of nature." As Dr. Jantsch wrote most movingly in his introduction to *The Self-Organizing Universe:*

> [The] new type of science which orients itself primarily at models of life, and not mechanical models, . . . is thematically and epistemologically related to those events which [are] aspects of the metafluctuation which rocked the world. The

> basic themes are always the same. They may be summarized by notions such as self-determination, self-organization and self-renewal; by the recognition of a systemic interconnectedness over space and time of all natural dynamics; by the logical supremacy of processes over spatial structures; by the role of fluctuations which render the law of large numbers invalid and give a chance to the individual and its creative imagination; by the openness and creativity of an evolution which is neither in its emerging and decaying structures, nor in the end result, predetermined. Science is about to recognize these principles as general laws of the dynamics of nature. Applied to humans and their systems of life, they appear therefore as principles of a profoundly natural way of life. The dualistic split into nature and culture may now be overcome.[3]

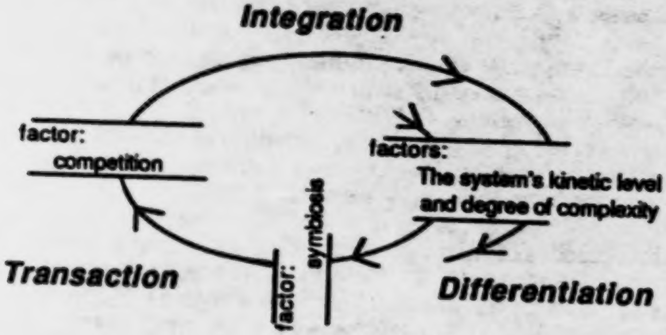
In the paper that follows, I attempt to describe the "systemic interconnectedness" of the "natural dynamics" that run vertically through the continuous evolution of biological and social systems.

The Process of Complexification

The evolution of both biological and social systems can be conceptualized as a perpetual sequence of three somewhat distinct processes: differentiation, transaction, and integration. These three processes reoccur as phases in an ever-widening gyre of system complexification so that, as Jantsch notes, "... evolution becomes a circular process in a four-dimensional space-time continuum."[4]

The process of complexification may be diagrammed as follows:

Figure 1
The Process of Complexification



Let's briefly follow the cycle around through its three phases, starting at three o'clock on the diagram. The rate and degree of differentiation in a living system are determined by the system's kinetic level (active energy level) and degree of complexity. These factors are best explained in terms of the physical chemist Ilya Prigogine's theory of dissipative structures, which runs somewhat as follows:

The "big bang" that gave birth to the universe as we now know it occurred approximately fifteen billion years ago.[5] Prior to this explosion the entire universe was compressed into an incredibly hot, dense mass no larger than a pinhead. Since the explosion, the universe has been expanding and cooling. If, as is likely, the universe is a finite, closed system, and if the total gravitational force within it is sufficient, at some point in the future the expansion may cease.

The Second Law of Thermodynamics stipulates that in any closed system--any system unable to import fresh usable energy from outside itself--a process of anti-differentiation gradually occurs: The system eventually becomes completely homogeneous and inactive throughout.

In cosmological terms this means that at some point in the far future our universe, if it is indeed closed, may reach a point of "heat death" at which, after all higher-order material structures have become undifferentiated, all tangible activity will cease.

In the terminology of thermodynamics, this gradual homogenization, loss of differentiation, and disintegration of tangible, usable energy is a process known as "entropy." The universe in its entirety is subject to this fatal process.

But to move backward in time: Approximately 10 1/2 billion years after the "big bang," or 4 1/2 billion years ago, our planet earth was formed. Less than a half billion years after that--very quickly in cosmological terms--the first elementary forms of life began to appear on this planet. Like every other material entity in the cosmos, these life forms, too, were subject to the entropy law: They were mortal. Over time they, too, were subject to disintegration, homogenization and death.

In a sense, though, the individual life forms were able to transcend death--to circumvent it, if you will--by generating approximate reproductions of themselves. They were able to do this because, unlike the universe in its totality, these living systems were neither finite nor closed. They were open systems. Through their permeable boundaries they were able to import fresh usable energy and basic chemical structures with which to replicate themselves, thereby counteracting the fatal mandate of the entropy law. It is for this reason that we say that living systems are negatively entropic, or "negentropic."

Ilya Prigogine referred to these negentropic structures as dissipative structures. That is, they consumed, or dissipated, external energy and structures in order to regenerate their own internal energy and structures.

But the regeneration was never an exact replication. The dissipative structures were constantly being slightly reordered, slightly changed, slightly differentiated, by the active or kinetic energy flowing through them. If the changes were minor, the living system suppressed them and retained its structural integrity.[6] If, however, the changes were major ones that were nevertheless still in line with the general direction of the system's evolution, then the dissipative structure could "escape" beyond its "threshold of stability" into a new and higher order, into a new level of meaningful complexity.

Being invested with new energy and order, often with an additional number of subsystems in themselves subject to change, the new, more complex system was even more unstable than the old one. Being more complex and yet more unstable, the new dissipative structure was increasingly subject to fluctuations that might become perpetually incorporated into the system if they were meaningful enough in terms of the system's long-range survival and growth.

As indicated at three o'clock in figure 1, the rate and degree of change, of differentiation, of negentropy, was proportionate to the system's kinetic level and degree of complexity. In other words, the more active the system, and the greater the number of subsystems within it that were subject to change through meaningful activity, the faster and more pronounced was the system's overall evolutionary metamorphosis.

Inherent in Prigogine's theory is an explanation of the reason why the rate of differentiation in complex biological and social systems seems to increase geometrically: "Complexity begets complexity."

During the second distinct phase of the complexification cycle, the transactional phase located at "six o'clock" in figure 1, the differentiated systems become complementary in their structures and functions. This state, known as symbiosis, provides the basis for mutually beneficial exchanges of the energy, matter and information (negentropy) which each living system "suck[s] . . . from its environment."[7]

As Bertrand Russell notes in *The Scientific Outlook*, "Every living thing is a sort of imperialist, seeking to transform as much as possible of its environment into itself and its seed."[8]

Imperialistic as living systems may be, however, they maintain a necessary, delicate balance of competition and cooperation in the context of organic and ecological suprasystems.

As indicated at "nine o'clock" in figure 1, this delicately balanced process of competition/cooperation is what stimulates effective long-term patterns of true integration in living systems. As I will explain in some detail later, these patterns of integration are governed by higher-order organizational principles known as "algorithms."

There is a question I have thought about over a period of many years. I regard it as the ultimate question in system theory:

Why do living systems complexify, defying the Second Law of Thermodynamics that dominates the overall long-term evolution of the physical universe? There is no denying that life on this planet is indeed a sort of small miracle that cannot be adequately explained by mere descriptions of structures or mechanisms.

Neither cybernetic, Darwinian, sociobiological nor theological explanations in themselves suffice to account for living systems' impetus toward complexification.

Prigogine's theory does however suggest a basis for this process--the idea that the evolution of living systems occurs through a relentless, eternal sequence of structural-functional differentiations and recombinations. These phenomena must be considered somewhat random in the sense that the astronomical number of possible recombinations, all adjusted through new forms of complementarity or symbiosis, are only somewhat predictable at this stage in the development of science.

We can say with some certainty, nevertheless, that a successful living system may be prone to pursue one of two evolutionary game plans: (1) An extremely high reproductive rate combined with a low level of internal complexification or structural-functional integration. (2) A lower reproductive rate balanced by the more expensive development of complex strategic subsystems that will aid the organism in the competition for natural resources.

Harvard's theoretical biologist John Tyler Bonner devoted much of his career to an exploration of the process of complexification in living systems. In his book *On Development: The Biology of Form* (1974), he discusses the reasons why a majority of living systems tend to complexify over a period of time:

> Those cells that find and process fuel most effectively will be more successful at reproduction. Any new quality the cell might acquire that will decrease its chances of destruction in the changing environment will increase its chances of success in producing offspring. Any new quality that simply gives the cell advantage in competition with other cells for food or for shelter will be favored by selection, and will eventually play a far more significant role than the speed of making copies.
>
> It is here, in fact, that we see the advantages of size appear for the first time. With an increase in size and concomitant increase in complexity, specialized structures appear. For instance, flagella arise which permit the cell to move; it can go toward food or away from adverse conditions. Spore formation appears which protects the cell against drought and other adverse environmental changes. Any increase in size and complexity will automatically mean a decrease in the rate of duplication or reproduction, but what is lost in duplication

speed is more than gained by successfully competing for limited resources and being less susceptible to environmental hazards.[9]

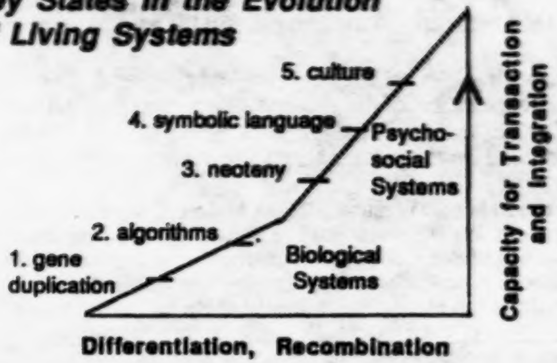
The basis of the impetus toward complexification is strikingly illustrated by the common slime mold, Dictyostelium discoideum. It consists of individual bacteria-eating amoebae which remain separate in periods when environmental conditions are favorable and food is plentiful, but which become temporarily integrated chemotactically under more adverse environmental conditions that threaten their survival as isolated individuals. As Eric Jantsch notes, it is the aggregate entity resulting from this integration that can move "along the earth in search of more favorable feeding places."[10]

Key Stages in the Evolution of Living Systems

There are five key stages in the evolution of complex living systems: (1) gene duplication, (2) algorithms, (3) neoteny, (4) symbolic language and (5) culture. Each is a stage in an unbroken continuum of increasing complexification in which higher rates and levels of differentiation/recombination become proportionate (in line with Prigogine's theory) to the capacity for transaction and integration, which increases markedly with the advent of psychosocial systems.

This continuum of complexification may be diagrammed as follows:

Figure 2
Key States in the Evolution of Living Systems



Sexuality, which began to develop well over a billion years ago, enhanced the genetic variety of living systems. Each act of sexual union doubled the number of development lines from which genetic variations were drawn, producing a reservoir of potentiality "so vast that only a part of it [was] used in a lifetime--the rest [serving as] the 'reserve' for epigenetic flexibility."[11] (Epigenetic flexibility is an organism's potential to evolve over time into a variety of forms adapted to a variety of environmental conditions.

The American geneticist Susumo Ohno has theorized that the foundation for rapid surges in mammalian and human evolution was laid at some point millions of years ago "when the forbears of man were still swimming in the sea or alternating between water and dry land."[12] At that point, in some "simple, generalized creature"[13] (most likely an amphibian of some sort), many exact, redundant, useless gene copies were produced which later mutated into genes with specific novel functions. Thus, over a period of time, "DNA was provided with redundancy in large quantities, and eventually the redundancy became useful information."[14]

In the terminology of information theory, the complexification of living systems is based on the combinational principle and algorithms. The combinational principle, in the words of Francis Crick, is the utilization of "only a small number of types of standard units, [such as the base pairs in the DNA molecule,] which are then combined in very many different ways. Writing is an excellent example of this principle."[15]

The rules, the "grammar," if you will, dictating the order of repeated combinations in a living system, constitute the algorithms predominant in that system. As Jeremy Campbell explains in *Grammatical Man: Information, Entropy, Language, and Life*:

> In its modern sense, an algorithm is some special method of manipulating symbols, especially one which uses a single basic procedure over and over again. It converts certain quantities into other quantities, using a finite number of transformation rules. Rules of language, for example, are of this kind. In the case of DNA, the rules may enable sets of genes to be copied over and over again and to be expressed as protein in various specific ways and not in others. The algorithm would be a kind of program, instructing certain combinations of genes to turn on or off at specific times, and it would be stored in the DNA text as information. It may be analogous to the grammar and syntax of English.[16]

The DNA text of mammals is 30 times as long as that of a sponge, yet only a little over one percent of this additional text "consist[s] of genes [coding] directly for proteins."[17]

These genes directly involved in the replication of proteins are known as structural genes. In Campbell's words, it was "one of the scandals of modern biology" when Emile Zuckerhandl reported in 1976 that the structural genes of chimpanzees and humans "are 99% identical." In fact, reported Zuckerhandl, the basic chemistry of chimpanzee and human brains is so similar that it may not really be asserted with any certainty that the more highly evolved human brain in fact contains a single new protein "with a genuinely novel function." "The uniqueness of the human brain," Zuckerhandl hypothesized, "must be due to structural and functional variants of pre-existing proteins and to variations in the quantity, timing, place and coordination of the action and interaction of these proteins."[18]

The key algorithm in the case of Homo sapiens, the algorithm which, in Campbell's eloquent words, made possible all "the fruits of the contemplative mind: myth, religion, art, literature, and philosophy,"[19] is the organizational principle known as neoteny.

The word "neoteny," literally meaning "holding youth," was first popularized by the Dutch anthropologist Louis Bolk in the early 1920s.

Neoteny, or paedomorphosis, "is the process whereby the fetal and/or juvenile traits of ancestors . . . are retained into later stages of individual development."[20]

The enigma of Homo sapiens is that externally the adult human being looks exactly like

> an ape which is still in the fetal or juvenile stage of development. . . . Reprogramming was the secret, changing the rules of timing. The strategic slowing down of [the human being's developmental] timetable arrested the growth of certain features of the primate anatomy, freezing them at an infantile stage of development. Fetal apes have flat faces, long necks, round heads, small teeth—and massive brains in relation to the weight of the whole body. The bones of the cranium are thin, the ridges over the brows undeveloped, and there is not much hair on the body. Even more remarkable, in an ape at the fetal stage, the place at which the spinal cord enters the skull lies directly under the brain, allowing an erect posture. As the ape develops, however, the place of entry shifts back behind the brain, making it impractical to stand upright. The retarded timetable adopted by humans means that this critical shift backward never takes place, and it enables the human to walk erect all through life.[21]

The retarded developmental timetable is not an evolutionary mechanism unique to Homo sapiens. Neoteny is a developmental strategy traceable all the way back through the entire line of primate evolution: While monkeys are dependent on their mothers' care for only a few months, chimpanzees remain in the childhood stage for four or five years, and human beings for three times as long as that.

The deep meaning of this long-term evolutionary strategy is quite clear. As Charles LeBaron notes, "with its hundred trillion synapses, the human brain offers the highest density of order and information, or negentropy, of any object in the known universe."[22] This organic complexity was generated as a product both of spontaneous gene duplication and of experiential diversity translated through sexuality into epigenetic flexibility. As Erich Jantsch put it, the gradual complexification of the genetic and neurological aspects of living systems really represents an expansion of the systems' capacity for "time-and space-binding."[23]

The process, however, as noted in figure 1 of this essay, is cyclical. As specified by Prigogine's Theory of Dissipative Structures, the rapid differentiation of genetic and neurological structures is predicated and intensified by the very complexity and level of negentropy of those structures. ("Complexity begets complexity.") Yet in the context of the Second Law of Thermodynamics there is nothing intrinsically "natural" about increasing complexification: In order for living systems to survive and thrive at ever-higher thresholds of stability, levels of increasing differentiation must be matched by increased levels of structural/functional integration that are justified, as James Bonner points out, by the system's enhanced capacity to extract matter, energy and information from its environment.

Neoteny, as a specific algorithm particularly significant in the context of primate and human evolution, ensures that there will be a meaningful fit between genetic/neurological (organic) and experiential (environmental) complexity. In Campbell's words,

> The more various the range of experience open to the individual, the more intense are the pressures for greater variety in the information system of the genes. This requires a long period of protected, predictable gestation, free from surprises and risks, enabling the intricate circuits and billions of nerve cells to be laid down in the brain under orderly, stable conditions. It also calls for a burst of genetic variety, switched on after birth. [Morris] Goodman believes that this blaze of postnatal richness may be the biochemical source of the tremendous range of different talents, tastes, skills, temperaments, and divergent types of thinking that is the mark of a successful society. In recognition of the fact that humans need both phases of the timetable, prenatal and postnatal, to rise to their intellectual preeminence in the animal kingdom, Goodman christens mankind "the conservative and revolutionary mammal."[24]

As Rene Dubos notes in *Beast or Angel? Choices That Make Us Human* , "life evolved progressively from a low level of unity toward a higher level of integration through the intermediary of pluralistic diversification."[25]

In human societies, persons may be diversified, differentiated, according to such factors as sex, age, rank and function. As Peacock & Kirsch note, functional differentiation in modern society may be especially rapid: "As specialties and skills change and multiply faster and faster, it becomes impossible for the individual to master all of them; and the mastery is accordingly divided among numerous specialists and specialized groups."[26]

Such diversity, functional and otherwise, according to Dubos' theory, stimulates the concurrent development of new "organs of communication" which make possible "a new and higher level of unity."[27]

The new organs of communication, in fact, become critically necessary, because as production systems become more complexified and sophisticated in the modern world, they become much more "interdependent with regard to natural resources."[28]

What are the new organs of communication that have been generated to facilitate the growth of complex human social systems? I see two essential ones: symbolic language and secondary group structures--and the secondary group structures, I think, are largely attributable to the existence of symbolic language.

It is important, in considering these concepts, not to fantasize too much about Man's uniqueness in the evolutionary scheme of things. Some theorists are prone to become unnecessarily mystical when evaluating human consciousness. One must realize that any special qualitative dimensions of human language must be attributed first of all to a very quantitative factor: The levels of complexity inherent in the human genetic and neurological systems. As the linguist Noam Chomsky suggests,

> Human language competence, which must be among the most complicated structures in the universe, arises uniquely in evolution at a certain stage of biological complexity. In other words, it appears when, and only when, evolution has led to an organism as complex as a human being.[29]

The deliberate use of symbolism may be traced very far back in human evolution, as far back as 300,000 years ago when Homo erectus was making symbolic engravings on ox ribs.

According to Bertalanffy, there are two somewhat distinct types of symbols: "(a) discursive (language in a broad sense, including technical languages of mathematics, etc.); (b) non-discursive (myth, art, customs, rituals and their material signs, etc.). . . . [I]t is proposed that discursive symbols are concerned with facts, whereas experiential or existential symbols are concerned with values."[30]

Both varieties of symbols, discursive and non-discursive, serve as efficient, flexible integrative mechanisms in human social systems. Discursive symbols helped give rise to the secondary group structures that are one hallmark of such systems. As Harry H. Turney-High notes in *Man and System: Foundation for the Study of Human Relations*,

> Secondary interaction is that type of human relationship wherein neither the originating nor the responding actors are in each other's physical presence in space and time, but rely on a material invention as a medium of communication or on the intervention of other parties. Many material inventions have no other function than to overcome the frustrating aspects of space. The terms telegraph, telephone, and teletype come at once to mind . . . . A host of such inventions could be listed, the written word being the most important . . . . Man is the only species capable of secondary interaction and transaction, and no human group is without it.[31]

To some extent, of course, what Bertalanffy calls the "non-discursive, or experiential, value-oriented" symbols also play a role in secondary group formation. For example, what would America be without its Uncle Sam, its Star Spangled Banner of red, white and blue, its national anthem?

Non-discursive symbolism also serves a special integrative function in religious institutions both primitive and modern. The very word "religion" is derived from the Latin verb "religare" (to bind), and religious symbolism serves to bind together human beings both horizontally (in organizational terms) and vertically (in historical terms). As Bernard Campbell observes in *Human Evolution*,

> birth rites, puberty rites, marriage rites [and] death rites . . . consolidate social roles and social structure, as well as bind members of the society together. But religion does more than that, for it directs social sentiments toward one stable and symbolic center. In many primitive societies, this further binding property of religion takes the form of ancestor worship, which creates, as it were, a continuum between the living and the dead.[32]

I wish, finally, to summarize what my central line of argument has been throughout this discussion of key stages in the evolution of living systems.

There are essentially two lines of thinking in regard to the matter of continuity or discontinuity in the evolution of biological and social systems. The anthropologist Marshall Sahlins, author of *The Use and Abuse of Biology: An Anthropological Critique of Sociobiology*, represents one line of thought in arguing that human symbolism and culture constitute a distinct qualitative break in the continuity of systems evolution. Human institutions, Sahlins asserts, require an entirely new type of analysis. The second school of thought is represented by system theorists such as Bertalanffy and Jantsch, biologists like Dubos, information theorists like Jeremy Campbell, linguists like Noam Chomsky and, this author.

We intrepid members of this second school will admit that, yes, human symbolism and culture represent a "great leap" ahead of the social and communicative mechanisms utilized by "lower" forms of life. Our argument, however, would be that there is a profound difference between a sudden leap and an infinite gap. Our argument would be that the "leap" from ape to man is the same sort of phenomenon represented by the "leap" from amphibian to mammalian phylogeny which occurred 165 million years ago. Both these leaps represented relatively rapid metamorphoses of phenotypes, the observable surface structures of living systems.

Preceding such rapid, almost "magical" phenotypical metamorphoses, however, were long periods of slow, calm genetic gestation in which multitudes of redundant, dormant gene copies were produced, lying quiescent for several million years until appropriate environmental conditions released the systems' latent capacity for epigenetic flexibility.

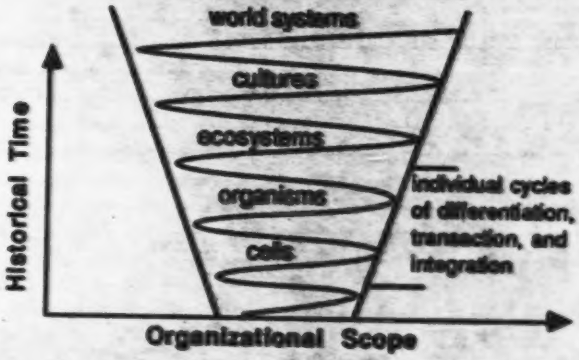
To be sure, then, admittedly, discontinuities and imbalances in relative rates of differentiation, transaction and integration are readily observable in the long-term evolution of living systems. The wheel of complexification does not revolve with monotonous exactitude. The three phases of the cycle, however, are equally manifest in the evolution of both biological and cultural systems, and it does not matter a whit whether we call such repetitive isomorphisms "homologous" or "analogous"; they are most aptly characterized, in Raymond Miller's words, simply as "similar developmental patterns . . . manifest throughout all of nature's systems."[30]

The Rationale for a Unitary View of Nature

I shall try to end this paper on a less technical, more personal note by summarizing the evolutionary model I've outlined and attempting to give a few reasons why I believe very deeply that such unitary models of nature are exceptionally useful for students in the 1980's.

The model itself, first of all, may be summarized in the following diagram:

Figure 3
The Power of Recurrence



I've entitled this diagram "The Power of Recurrence," because that is essntially the lesson inherent in the model I've outlined. A relatively definable and comprehensible, if not exactly simple, pattern of differentiation, transaction and integration emerged when the very fist amino acids began to form on this earth four billion years ago. As the late Ilya Prigogine demonstrated through his elegant mathematics, the pattern is predominant in purely physical systems whether we want to call them "living" or not. And the pattern persists or recurs in

33[illegible]11

other areas: Biologists such as Rene Dubos provide us with reasonable proof that the processes of differentiation and integration are fundamental in the evolution of living systems, and social scientists such as Alfred Kuhn make transactional and integrative processes a fundamental part of their models of human social systems.

So what is the human message here? Having taught at the secondary and college level for over thirteen years, I know that the typical American high school student graduates having been exposed to thousands of "facts" and "answers" in the context of thousands of fifty-minute periods. The environment in which he has perhaps been learning is one hopelessly fragmented, not least of all by ringing bells. What of the "knowledge" he's left within the final analysis?

Most likely he'll have taken three or four courses in English, a couple in mathematics, two or three in the physical and biological sciences, and probably about an equal number in history and government. It can be stated almost as a certitude that nowhere along the way has he worked with teachers possessing the desire, imagination, insight or academic framework with which to encourage deeply significant syntheses of these areas.

Consider for example, how unlikely it is that he would have encountered the idea that the genetic systems he studies in biology and the grammatical system he studies in English both evolve and change because of higher-order organizational principles acting on a very finite number of basic informational units. It wouldn't be necessary in order to convey this idea to cite any of the more abstruse aspects of information theory, nor would it be necessary to talk about the combinational principle and algorithms when suggesting the existence of basic informational units and higher-order organizational patterns. The important thing is that the student should be exposed to the exciting, intriguing probability that there is a common yet marvelously uncommon link between two courses and two academic fields, and, more marvelously than that, between the intrinsic logic inherent in the words in his mouth and the genes in his cells.

Young, flexible, curious, promising minds have a right to more--more than rote "knowledge," more than deceptively simplistic answers to multiple choice questions, more than mass-produced diplomas representing fragmented learning environments and fragmented world views. It should be not the tangential and incidental, but rather the primary and fundamental function of educators to possess and convey to their students an ineradicable sense of the miraculous interconnectedness of life, to make the miracles explicit, to make them coherent.

Education without progressive meaningful synthesis is nothing. The English poet John Milton realized this 350 years ago when he advocated in his essay "Of Education" that over a period of years high quality instruction must inevitably proceed from the conveyance of linguistic/mathematical modes of communication, to exposure to various scientific methodologies, and finally to creative opportunities for students to synthesize personal, coherent world views that can excite and sustain them, both intellectually and ethically, till the end of their lives. Milton, for his time and place in history, regarded rhetoric and ethics as the ultimate interdisciplinary endeavors through which young people might begin to become personally engaged in lifelong quests for valid, sustaining syntheses.[34]

I believe that for our time and place in history--building on the diverse, eclectic, insular, quarrelsome scientific endeavors of the last century--some attempt at a truly meaningful synthesis must be sincerely made, and made not merely for the sake of the extrication or sanctification of any wing of the academic establishment, but for the sake of students.

The first step in this endeavor must be the formulation of some kind of unitary view of nature that meets two criteria: 1. It must be connectible to and coherent with the longstanding, valid contributions emanating from eclectic yet sound scientific disciplines. 2. It must constitute a world view (or set of them) that is capable of being transmitted to students in gradual stages of depth and sophistication.

The sort of unitary view I've promulgated in this essay, I think, adequately meets these two criteria. It has a central question: "Why does the evolution of biosocial systems during the last four billion years exhibit recurring cycles of identical, isomorphic processes contributing to a clear yet still mysterious thread of continuously increasing complexification that flies in the face of the Second Law of Thermodynamics, that is, toward complexity and away from entropy? I have attempted to answer this question utilizing useful contributions from such diverse disciplines as physical chemistry, genetics, theoretical biology, information theory, linguistics, anthropology and sociology.

The unitary view also can be presented to students of various ages in various stages of depth and sophistication. Though college students might be at least a little bit mercilessly exposed to the details and ramifications of such concepts as entropy, the Combinational Law, algorithms and epigenesis, teachers at the secondary school level can just as easily and effectively talk abut such matters as the deterioration of energy, basic informational units, higher-order organizational patterns, and the emergence of organisms from genes. Indeed, there is good evidence that basic systems concepts can be successfully taught to very young students--much younger, in fact, than those of high school age.[35] So the difficulty of the task hardly seems prohibitive.

Use of the word "system" in this discussion is perhaps misleading because for many people it connotes a brand of inhuman, inhumane, rigid, mechanistic, materialistic determinism from which they find it possible to conjure haunting visions of *1984* and cruel metal humanoids creaking their way around the world. All this and more, the nightmare goes, may come from accepting a watered-down view of our humanness: We will become what we think we are, and we should consequently avoid any temptation to think of ourselves as just another material system playing an essentially mindless, spiritless role in what is admittedly a predominantly impersonal universe.

But this is not a necessary view of a "system" or of man as part of a system. As Bertalanffy defines it, a "system" is simply a set of entities interacting within the context of some kind of fairly consistent, comprehensible pattern. The entities need not be seen as non-spiritual nor the patterns as strictly material or rigidly predetermined.

It is, however, necessary to insist that our human life, whatever else it may be, is a subset of biological life which is itself a subset of the purely physical universe. Without truly, humbly recognizing our ecological embeddedness in fragile biological and physical suprasystems, without adopting spirituality in its ultimate sense, we are inevitably destined to perish under the sheer weight of a technological sophistication that has become arrogance. The systems paradigm, the unitary view of nature, is a long-overdue antidote to such fatal anthropocentric egotism: When the first amino acids started to conjoin with others in the primordial seas, there was nothing to indicate that we should necessarily be one of the end products of four billion years of tentative, lurching creation. It has always been, according to Progogine, the instability and tentativeness of living systems that allowed them to "escape" recurrently into existences as entities of a higher order and a greater organizational scope. Perhaps, as Bonner pointed out, this increased complexity, this increased organizational scope, has been advantageous--and perhaps there is a very definite rationale for the complexification process. But there are no ironclad inevitabilities. The preeminent aspect of evolution is its pervasive fluidity.

We are, then, led back to the ideas of the late Erich Jantsch, with which we began: "Every day of our lives," he wrote, "we serve as significant participants in an evolution which is neither in its emerging and decaying structures, nor in the end result, predetermined. Science is about to recognize these principles as general laws of the dynamics of nature. Applied to humans and their systems of life, they appear therefore as principles of a profoundly natural way of life."[38]

NOTES

[1] Kirtley F. Mather, "Objectives and Nature of Integrative Studies," *Main Currents in Modern Thought*, as cited by Robert W. Winquist in "What Are Transdisciplinary Principles?" *Issues in Integrative Studies*, 1982, pp. 49-50.

[2] Ludwig von Bertalanffy, *General Systems Theory: Foundations, Development, Applications.* (New York: Braziller, 1968), p. 38.

[3] Erich Jantsch, *The Self-Organizing Universe.* (New York: Pergamon Press, 1980), p. 8.

[4] Jantsch, *op. cit.*, p. 237.

[5] John D. Barrow and Joseph Silk, *The Left Hand of Creation: The Origin and Evolution of the Expanding Universe.* (New York: Basic Books, 1983), p. 10.

[6] Marilyn Ferguson, *The Aquarian Conspiracy: Personal and Social Transformation in the 1980s.* (Los Angeles: J. P. Tarcher, Inc., 1980), p. 164. For a more detailed presentation of the Theory of Dissipative Structures, see: Ilya Prigogine, "Order Through Fluctuation: Self-Organization and Social System," in Erich Jantsch and Conrad H. Waddington, eds., *Evolution and Consciousness: Human Systems in Transition.* (Reading, Mass., London and Amsterdam: Addison-Wesley, 1976).

[7] Erwin Schrodinger, *What Is Life? The Physical Aspect of the Living Cell*. (New York: Macmillan, 1947), pp. 72, 75. As quoted by Jeremy Rifkin in *Entropy: A New World View.* (New York: Bantam Books, 1981), p. 52.

[8] Bertrand Russell, *The Scientific Outlook.* (New York: Norton, 1962). As quoted by Rifkin, op. cit., p. 53.

[9] John Tyler Bonner, *On Development: The Biology of Form.* (Cambridge, Mass.: Harvard University Press, 1974), pp. 77-78.

[10] Erich Jantsch, *The Self-Organizing Universe.* p. 129.

[11] *Ibid.*, p. 125.

[12] Jeremy Campbell, *Grammatical Man: Information, Entropy, Language and Life.* (New York: Simon & Schuster, 1982), p. 150, citing Susumo Ohno, *Evolution by Gene Duplication.* (New York: Springer-Verlag, 1970).

[13] *Ibid.*

[14] *Ibid.*

[15] Francis Crick, *Life Itself: Its Origins and Nature*. (New York: Simon & Schuster, 1981), p. 59.

[16] Jeremy Campbell, *op. cit.*, p. 130.

[17] *Ibid.*, p. 133.

[18] Emile Zuckerhandl, "Programs of Gene Action in Progressive Evolution," in Morris Goodman, Richard E. Tashian, and Jeanne H. Tashian, eds., *Molecular Anthropology*. (New York: Plenum Publishing, 1976), pp. 387-447.

[19] Jeremy Campbell, *op. cit.*, p. 141.

[20] Ashley Montagu, *Growing Young*. (New York: McGraw-Hill, 1981), p. 9.

[21] Jeremy Campbell, *op. cit.*, p. 139.

[22] Charles LeBaron, *Gentle Vengeance: An Account of the First Year at Harvard Medical School*. (New York: Richard Marek Publishers, 1981), p. 70.

[23] Erich Jantsch, *The Self-Organizing Universe*, p. 237.

[24] Jeremy Campbell, *op. cit.*, p. 136.

[25] Rene Dubos, *Beast or Angel? Choices That Make Us Human*. (New York: Scribners, 1974), p. 181.

[26] James L. Peacock and A. Thomas Kirsch, *The Human Direction: An Evolutionary Approach to Social and Cultural Anthropology*. (New York: Appleton-Century-Crofts, 1970), p. 284.

[27] Dubos, *op. cit.*, p. 187.

[28] *Ibid.*, p. 189.

[29] Jeremy Campbell, op. cit., p. 102, citing Noam Chomsky, *Language and Mind*, enlarged ed. (New York: Harcourt, 1972).

[30] Bertalanffy, *Systems View of Man*, pp. 53, 55.

[31] Harry H. Turney-High, *Man and System: Foundation for the Study of Human Relations*. (New York: Appleton-Century-Crofts, 1968), pp. 185, 192.

[32] Bernard G. Campbell, *Human Evolution: An Introduction to Man's Adaptations*. (Chicago: Aldine, 1974), p. 360.

[33] Raymond C. Miller, "Varieties of Interdisciplinary Approaches in the Social Sciences: A 1981 Overview." *Issues in Integrative Studies*, 1982, p. 23.

[34] John Milton, "Of Education," in Oliver Morley Ainsworth, ed., *Milton on Education: The Tractate of Education With Supplementary Extracts from Other Writings of Milton.* Volume XII of the Cornell Studies in English Series. (New Haven: Yale University Press, 1928), pp. 51-64.

[35] Ruth-Ellen & J. P. Miller, "Systems Concepts for Early Grades," in *General Systems: Yearbook of the Society for General Systems Reserach*, vol. XXVI (1981), pp. 253-259.

[36] *Op. Cit.*, p. 8.

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ON BECOMING A SOCIAL SCIENTIST

By Shulamit Reinharz: A Critical Review

Bob Arango

In her very interesting and provocative study, Shulamit Reinharz describes and analyzes the issues, dilemmas, and personal crises involved in becoming a social scientist.[1] She employs herself as a case study via an introspective, intellectual autobiography, in an attempt to illustrate the process by which she struggled with the dilemmas of different sociological methods, attempted resolutions, and formed her identity as a sociologist. Her aim in the study is to illustrate "the intertwined development of method and identity" to "change the consciousness of the reader by questioning the assumptions and practices of various research methods", and to propose an alternative method (experiential analysis") in an attempt to "rehumanize" the sociologist, sociology, and society.[2]

I

Reinharz characterizes socialization into an academic discipline as the dual search for identity and method. One of her major hypotheses is that "socialization can be fruitfully understood precisely as the creation of a sense of identity hinged on the resolution of conflicts concerning method."[3] She focuses on the changing perceptions of the self and the profession as the student moves through the undergraduate and graduate experience. The crucial element for her is the sequence of research projects, because she believes that "methods reflect personal values," and holds research to be the "mastery-inducing experience."[4] In sum, "In the role playing of research, the persons being socialized discover themselves and their profession."[5]

Reinharz uses three research projects (a conventional survey study, a participant observation study in a mental hospital, and a team fieldwork study in an Israeli town) to illustrate her growing alienation and disillusionment with the traditional methods in sociology. In the process of research, she discovered numerous discrepancies between research practice and how the traditional methods are ideally presented in the university. The result of these discrepancies for students, she claims, is an identity crisis and the emergence of a new identity "either as a creative or as a conformist resolution of dissonance within a discipline." She concludes that "socialization (the acquisition of an identity and a method of action) requires the personal resolution of the inherent conflicts, not the simple adoption of the given definitions."[6]

II

Reinharz calls for the redefinition of research and proposes a tripartite set of criteria by which to evaluate social research: "All projects should generate knowledge within the three components engaged in a research project: person, problem, and method. In this scheme self-knowledge (person) is a necessary and publicly relevant product of social research."[7]

When she began her socialization, Reinharz notes that she accepted the scientific model of "mainstream" sociology, i.e., the problem-solving approach which proceeds rigorously and self-consciously from questions to hypotheses to verified conclusions. She also adopted the textbook notion of research, which integrates problem and method but considers the researcher-as-person as irrelevant or as a potential source of bias. However, her experience with survey empiricism led her to conclude that the scientific model is replete with implicit assumptions that elicit patterned ways of defining a situation. In sum, it is a "ritual inhibiting discovery" whose function is to protect researchers against colleagues' criticisms of procedural errors, and against the criticism of sponsors who are potentially dissatisfied with results.[8]

Reinharz argues that survey empiricism assumes that the social scientist is unique, autonomous, value-free, and transcends social life, when in fact "detachment is impossible in practice and undesirable as an ideal." She argues that "personal values creep into all the components that are supposed to be regulated only by scientific procedure, from the definition of the research topic to the preparation of the report" because "presuppositions cannot be entirely stripped." She concludes that detachment leads to disinterest and alienation.[9]

In addition to assuming a static reality that can be controlled and measured, survey empiricism assumes that problems and questions are selected "objectively," whereas they are often selected to fit the method. It assumes that respondents are objects and that answers to questionnaires are accurate, whereas respondents are humans whose responses are influenced not only by the questions themselves, but by the context in which the questionnaire is presented, and the "audience effect." It assumes that deception is necessary in order to insure subject compliance, whereas deceptive research assumes "that better knowledge can be obtained from a naive subject than from an informed collaborator." In addition, Reinharz feels that control over subjects is a "fantasy." Therefore, "The results reflected the researchers, the questionnaire, and the readers rather than the people questioned."[10]

From her experience in the survey research project, Reinharz concludes that survey empiricism is an aggressive "rape model" of research whose "fundamental problem is the researcher's assumption of a 'right to know' that serves as a carte blanche for activities that contradict other values," and that "the tension between the 'ideal' of experience denial or value freedom and the impossibility of achieving that ideal produces deviousness, ritualism, and evasiveness within the research process" and leads to the dehumanization of the scientist and the subject. In addition, Reinharz concludes that truth cannot be defined in mathematical terms, that self awareness must be restored as a source of "insight," because bias is "nothing more than being human and socially structured." Finally, she concludes that "Objectivity should thus be redefined from the elimination of the influence of the investigator's personal features to a clear understanding of their influence."[11]

III

The discrepancy between the ideal and the real experience of her initial research project led Reinharz to seek a method of social research that could serve as an alternative to survey empiricism. In her second research project, Reinharz focuses on the dilemmas of detached participant observation as a research method. The second project was initially concerned with a participant observation study on friendships among patients in a mental hospital, but was changed in the field to include the significance of special relationships among staff and patients.[12]

As a graduate student at Brandeis University, Reinharz was influenced by the critical and humanistic approach of the faculty. Social psychology became her area of specialization, and she now sought to understand meaning in terms of the actor's perspective. Her method in the second project consisted of defining a general problem, preparing for entry into the field by reviewing some of the literature, and refining the problem. She was soon faced with the many dilemmas and limits of the participant observation method.[13]

In defining the research problem, Reinharz was confronted with the "dilemma of commitment:" "In the subtle matter of selecting a research problem and site, the researcher's unconscious and conscious needs seek fulfillment." Retrospectively, she concluded that the difficulty lay in formulating the problem before erntering the field, rather than letting the problem arise from the research process in the particular field setting.[14]

Reinharz notes that a second set of problems with the participant observation method concerned the "dilemma of preparedness:" "(1) the tension between entering the research project with no preconceptions (which is impossible) or with predetermined definitions. (2) the degree of generality (or specificity) with which the research problems are posed, and (3) the degree of rigidity (or flexibility) with which the topic is maintained." She notes that an additional problem concerns the mastery of the literature: "Simply put, it cannot be mastered."[15]

Retrospectively, Reinharz resolved these dilemmas, which lead to blocked research, by freeing herself from prefield perceptions and rigidity. She did this by employing an unprepared approach that freed her to "explore the field as it presented itself to me and to relate it to the literature retrospectively." She concludes that "everything should be recognized as potential data."[16]

A third set of problems with the participant observation method concerns the dilemmas in selecting a role and stance for fieldwork. For Reinharz, "The selected role reflects both the self the researcher wishes to present and the particular definition of participant observation being used. Toegher these form the researcher's 'stance.' Reinharz found that there are dilemmas and limits inherent in the entire continuum of stances from complete observer to complete participant ("going native"). The main dilemma concerns "competing identities in the field," and the attempt to employ "multiple stances:" "Although these multiple stances optimize access to the social system, the researcher feels fragmented and inconsistent." The result is often role conflict between assumed role and research role, self-deception, manipulation, and identity confusion.[17]

Retrospectively, Reinharz resolved these dilemmas for herself by insuring that "the mode of self-presentation should be worked out before entry into the field" and by seeking "a higher level of reciprocity" with clients by "engaging in studies only upon client request, encouraging the client's active collaboration, and sharing findings and reports with setting members." She resolved the problem of identity crisis by recognizing that the task of sociology is not to provide a perfect description of all data, but to develop a theory to account for aspects of behavior, and thus by developing a theory of her own.[18]

In order to illustrate the "stress of detached fieldwork," Reinharz points out the dilemmas of gathering data. She resolved the dilemma implied in the attempt to record everything by learning to be "selective rather than inclusive in observing and recording." She resolved the dilemma of defining the boundaries of the system under study by recognizing that "all system boundaries are artificial and arbitrary," and thus by "shifting back and forth" between a necessarily larger context and a smaller adequate context. She resolved the dilemma of choosing indicators by learning "to not pay attention when the scope became unwieldy, and to abandon indicators that were too numerous to pursue." She resolved the involvement-detachment dilemma by accepting "passivity" in the data-gathering process and "rigorous activity" in the recording and analysis process. An additional dilemma of data gathering was the "multiplicity of perspectives." One of Reinharz's major assumptions is that "there is no single correct description of anything in the field, since every description stems from an observational perspective." She resolves (for herself) the dilemma of bias in perspective by assuming that all perspectives are valid.[19]

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Reinharz relates that the most significant problem she encountered in gathering and recording data was the "internal noise" of anger and anxiety resulting from the attempt to suppress her personal responses, i.e. suppressing her humanness. She resolved this dilemma (for herself) by considering her personal feelings as data themselves, by considering self-observation as a special source of evidence, by utilizing her personal responses to the environment as "the very avenue for learning about that environment;" in sum, by a creative use of bias."[20]

Reinharz states that a final set of problems concerns the dilemmas characteristic of drawing conclusions from detached participant observation fieldwork, i.e. problems of validity, proof, generalization, and publication. She perceives that one of the cardinal dilemmas of participant observation reseach is that "it is never finished:" "Conclusions are temporary and reflect the current coming to terms with the research experience." However, since participant observation relies on the uniquely human qualities of the observer, it "benefits from hindsight."[21]

From her participant observation study, Reinharz concludes that research must be redefined to integrate the person with the problem and the method, that the implicit values, beliefs, and commitments underlying one's reasoning have to be made explicit, and that "participant observation fieldwork is a frustrating, anxiety-provoking, yet personally fulfilling process that is experienced; it is not a technology."[22]

IV

It was during her team fieldwork study in an Israeli town in 1970-71 that Reinharz refined and extended the participant observation method to include person, team, problem, and method. Her new method resulted from her discovery of the team group process and was a synthesis of phenomenology and "action research." She notes that with the "discovery" of experiential analysis" her professional identification "became less tied to an academic discipline than to a method that could be affiliated with diverse disciplines."[23]

In keeping with her new method, the Israeli project initially focused on the effects of shelling on a border town, but was changed in the field to focus on two topics: "problems and coping behaviors of varoius groups in the town and the problems and coping behavior of the team members in the group project."[24]

Reinharz notes that the prefield entry phase of the team project "contrasted favorably with the preparatory vacuum of the survey project and the unexamined assumptions and accepted deifnitions" of the detached participant observation study. She had resolved the dilemma of preparedness by differentiating information from expectations and differentiating the perspective of the insider with vested interests from those of the temporary researcher. She resolved the potential dilemma of discrepancies between prefield information and field experience by noting "the necessity of evaluating preentry information in the light of experiences in the field," and by "contrasting insiders' and outsiders' information or interpretations" via "feedback consultation."[25]

Reinharz employed a method of "pattern building" in the field for making sense of disconnected observations: "a method of organizing data by recording incidents or statements, watching for recurrences, and trying to formulate patterns. The next step is to challenge the pattern by testing if it covered the next related incident and if members of the setting considered it meaningful."[26]

On the basis of her field experience, Reinharz formulated her hypotheses on group dynamics: "the group pressure to conform, the group's ambivalence to autonomy, its analogy to a family, the members' use of the project for private agendas and personal growth, the instability of a four-member group, and the impact of the pressures of time, danger, and climate." Among the benefits of teamwork she notes the "possibility of receiving immediate feedback on every aspect of my work," that "a team can gather more data," and that it can provide a holistic approach to research.[27]

Reinharz argues that the experiential method has therapeutic effects on the subjects being studied, i.e. for catharsis, reinforcement, and for the organization of thoughts. This beneficial impact of "temporary affiliation" between fieldworkers and subjects is based on "interviewing procedures that are informal, unstructured and not standardized" and "an open interactive style" that "allows the researcher to discover the subjects' qualities in their own terms." Reinharz states that the "feedback consultation" phase of the study must be conscious of the "multiple perceptions of a situation," must avoid blaming the victim, must be seen as a continuity of the research process, and must convey findings to audiences in usable form.[28]

Reinharz concludes that the aim of research is theory, the tests of findings of experiential teamwork are "comprehensibility and applicability," that "fieldwork can be redefined as the activity in which researchers undergo experiences similar to those of the people being studied," and that teamwork is a check on self-deception.[29]

V

There is much to commend in Reinharz's attempt to develop a "new method" for social research ("experiential analysis"). Her attempt to transcend the rigidity and narrowly structured perspective of disciplinarity by employing a transdisciplinary research strategy (phenomenology) is commendable.[30]

Reinharz employs a holistic approach in an attempt to study experiences in their entirety, to learn "what it is and how it fits" into the whole. She employs an "experiential language" which she feels has a transdisciplinary application. She employs an interdisciplinary teamwork method that has a general applicability in pursuing problems which emerge across, as well as in-between, the specialized disciplines. She advocates a discipline-transcending pedagogy that includes "systematic self-analysis as part of training." She employs a research strategy that has a theory-building as well as a problem-solving purpose. Finally, she employs a research strategy that facilitates rather than inhibits social activism.[31]

Reinharz is convincing in her argument of "the intertwined development of method and identity" in the socialization of the social scientist. She is convincing in her critique of the positivist assumptions and inadequacies of survey empiricism and the detached participant observation methods. Her call for a redefinition of research to make explicit one's implicit assumptions, and to "rehumanize" the social scientist, the social disciplines and society, are commendable. However, Reinharz is less convincing in her explicit phenomenological assumptions and her advocacy of a "creative use of bias." Only by accepting the phenomenological assumption of Husserl, Kierkegaard, and Dilthey that there is an ontological distinction between nature and society, that there are no "fixed laws" in social life only a "process of becoming," can she conclude that the attempt to discover laws in social life and to control the social world is simply scientific arrogance, and that social science requires a method different from that of the natural sciences.[32]

Reinharz does not explain why social history could not consist of a unity of both "fixed laws" and "processes of becoming," as occurs in natural history. Some social scientists would argue that the conditioning nature of the technoeconomic infrastructure upon the social structure and the ideological superstructure in society are no less "fixed laws" than such "processes of becoming" as the development of social classes, exploitation, class struggle, social revolution, and social development.[33]

Only by accepting the phenomenological assumption that meaning can only be understood subjectively, as lived experience, can Reinharz accept subjectivity as a method of social science. Only by assuming an identity between meaning and behavior can Reinharz deny that behavior is worth studying independently of meaning, reject the possibility of separating the observers from the observed, and conclude that the task of social science is to explicate meaning, i.e. the mental superstructure, and nothing more.[34]

However, in social science it is crucial to differentiate the felt feeling of freedom and purpose behind one's actions, and the unintended consequences of one's behavior. The meaningful, intentional actions of individuals correspond or clash with that of other individuals, so that the desired outcome is only rarely achieved. The results are often what no one sought to achieve nor could forsee. So in spite of the existence of individual meaning and purpose, social history has proceeded in the manner of a natural process independent of individual meaning and with its own laws of motion. Therefore, behavior is not identical with meaning, it is worth studying independently of meaning, the observers can be separated from the observed, and the task of social science, as in natural science, is to discover the laws of social life. Whereas Reinharz assumes meaning and self-awareness as the start for understanding social life,[35] it is the understanding of social life that is the start for understanding meaning and self-awareness. Life is not only a struggle for meaning, but a struggle for sustenance and for power.

Only by equating the scientific method with extreme positivism and inductionism can Reinharz assume that science is just another belief system and that all perceptions are equally valid.[36] As Harris notes, "It does not follow from our inability to obtain absolutely certain knowledge that all knowledge is equally uncertain."[37] Science is not a one-sided positivism nor inductionism, it is a synthesis of induction and deduction, of empiricism and rationalism. Its proof is the demonstration of overwhelming probability, and the natural selection of paradigms. It is the clash of scientific paradigms or research strategies that guarantees an open mind, i.e. "objectivity." The solution to the problem of bias is not to abandon the attempt to be scientific, but to attempt to overcome subjective limitations by being more scientific. Because it is transcultural and not relative to specific groups or cultures, the scientific method is not just another belief system.[38]

What is Reinharz's alternative? She would abandon the tool of science because, like any tool, it is subject to abuse. Rather than advocate more and better science she advocates less science, and a glorification of egoism and subjectivity. Her source of knowledge is "insight," "intuition," and "preverbal experience." Her validity criteria include a "felt response," a "sense of closure," and that the explication must "make sense" to the members of the setting. Her criterion of certainty is the "irrefutable" experience of relived phenomena. Teamwork is her check on self-deception.[39]

While Reinharz differentiates between "explication" and "experience" and employs "teamwork" as a way of assessing knowledge,[40] she fails in her attempt to transcend a purely phenomenological approach. To assume that a participant observer can relive the experience of the subjects is a naive fantasy. With Reinharz's method there can be no proof that one's subjective experience is accurate, because the experience itself is the measure of accuracy. Teamwork is a necessary but not sufficient check on self-deception, since all the team members may employ the same research strategy.

What profound insights did Reinharz discover with her experiential method? From her experiential study in the Israeli town, Reinharz relates the following insights and discoveries: "One feels safer by virtue of acting;" "the psychological value of seemingly irrational behavior;" "the individual subjugation to the group norm;" "the strength and potential demoralizing effect of rumors;" "rumor-defying or fear-reducing explanations must be plausible;" "Under stress such as fear, the senses can be partially immobilized;" "Fear cannot remain at a crisis stage; eventually it becomes routine."[41] These were the profound "insights" "discovered" by Reinharz through the employment of her "new" method. By substituting a subjective for a scientific method, she neither sheds new light on old problems nor provides a new alternative perspective. What she has in fact achieved is the discovery of the obvious, by reinventing the same old wheel of phenomenology (with slight variations) and attempting to employ it in social research.

Reinharz's call for a "rehumanization" of the social scientist, the social disciplines, and society is commendable, but it is based on the erroneous assumption that a scientific approach is dehumanizing. A scientific approach in social research appears dehumanizing because it explains behavior independently of meaning, and questions the Liberal ideal of the autonomous individual. A scientific approach offers an alternative explanation of behavior for which the individual himself was previously given credit, i.e. it reveals individual behavior to be socially conditioned, and undermines all forms of egoism and subjectivism. Conversely, Reinharz's experiential research strategy leads not only to intellectual obfuscation, but also to moral opacity. Because her investigation of assumptions and presuppositions stops short of a social class analysis, an unintended consequence of her strategy is to further aid in the dehumanization of exploited peoples. For example, she labels all the Palestinians fighting for their homeland as "terrorists."[42]

NOTES

[1] Shulamit Reinharz, *On Becoming a Social Scientist: From Survey Research and Participant Observation to Experiential Analysis* (San Francisco: Jossey-Bass Publishers, 1979).

[2] *Ibid.*, p. xii; pp. 370-371; p. 37.

[3] *Ibid.*, p. x.

[4] *Ibid.*, p. 29.

[5] *Ibid.*, p. 371.

[6] *Ibid.*, pp. 374-75.

[7] *Ibid.*, p. 370.

[8] *Ibid.*, p. 67.

[9] *Ibid.*, p. 247; p. 113; p. 251.

[10] *Ibid.*, p. 64; p. 95; p. 92; p. 115; p. 119.

[11] *Ibid.*, p. 95; p. 114; p. 247; p. 255.

[12] *Ibid.*, p. 127; p. 231.

[13] *Ibid.*, p. 132; p. 135; p. 145.

[14] *Ibid.*, p. 141; p. 140.

[15] *Ibid.*, p. 155.

[16] *Ibid.*, p. 149; p. 152.

[17] *Ibid.*, p. 156; p. 161.

[18] *Ibid.*, p. 158; p. 163; p. 176.

[19] *Ibid.*, p. 202; p. 205; p. 206; p. 209; p. 211.

[20] *Ibid.*, p. 212; p. 225.

[21] *Ibid.*, pp. 233-35.

[22] *Ibid.*, p. 237.

[23] *Ibid.*, p. 264-65.

[24] *Ibid.*, p.263; p. 268.

[25] *Ibid.*, p. 273; p. 277; p. 279.

[26] *Ibid.*, p. 282.

[27] *Ibid.*, pp. 303-05.

[28] *Ibid.*, p. 318; p. 315; p. 319; pp. 324-25; p. 330.

[29] *Ibid.*, p. 333; p. 326; pp. 339-40; p. 353.

[30] Cf. Raymond C. Miller, "Varieties of Interdisciplinary Approaches in the Social Sciences," *Issues in Integrative Studies*, No. 1 (1982); Marvin Harris, *Cultural Materialism: The Struggle for a Science of Culture* (New York: Random House, 1979).

[31] Reinharz, p. 363; p. 262; p. 265; p. 356; p. 176; pp. 38-40.

[32] *Ibid.*, p. 243; p. 254.

[33] i.e., Cultural Materialists and Dialectical Materialists.

[34] Reinharz, pp. 355-56.

[35] *Ibid.*, p. 254.

[36] *Ibid*, p. 246; p. 211.

[37] Harris, p. 322.

[38] Cf. Harris, 316-27.

[39] Reinharz, pp. 359-63.

[40] *Ibid.*, p. 359; p. 362.

[41] *Ibid.*, pp. 348-51.

[42] *Ibid.*, p. 270

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